

Report for
City of Fitchburg, Wisconsin

McKee Road Traffic Impact Analysis (TIA)

Prepared by:

STRAND ASSOCIATES, INC.®
910 West Wingra Drive
Madison, WI 53715
strand.com

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SECTION 1
INTRODUCTION AND EXECUTIVE SUMMARY

PART A. PURPOSE OF REPORT AND STUDY OBJECTIVES

Several developers have expressed interest in developing or redeveloping land along the McKee Road (CTH PD) corridor west of Verona Road (USH 18/USH 151) in the City of Fitchburg. The McKee Road corridor is increasing in importance as the southwest portion of the Madison metropolitan area grows. Current traffic volumes already create congestion during the morning and evening peak hours, and further development along McKee Road and to the southwest of the Fitchburg will exacerbate these conditions. This traffic impact analysis (TIA) looks at the McKee Road corridor to determine what improvements will be necessary to accommodate background regional growth and McKee Road development. This report:

- Analyzes existing 2005 and 2020 operating conditions on the McKee Road corridor without McKee Road development in Fitchburg.
- Analyzes 2005 and 2020 operating conditions on McKee Road with McKee Road development in Fitchburg.
- Suggests and analyzes roadway improvements to help minimize the impacts of area growth to the roadway system.

Because of area growth, travelers will need to grow accustomed to increasing congestion levels. In all circumstances, operation levels will deteriorate, and there are few-to-no improvement options that can fully address the anticipated traffic demands that will be placed on these corridors.

PART B. EXECUTIVE SUMMARY

This TIA considers five potential “on-site” developments along McKee Road (CTH PD) and Nesbitt Road in the City of Fitchburg, Wisconsin. The following paragraphs summarize possible development concepts for properties that front McKee Road. The following land use assumptions are for traffic analysis purposes only and do not constitute City approval of land use or density.

- Development E is currently occupied by a distributor (E.Z. Gregory), a tavern (Monkeyshines), a car service center (CarQuest) and the eastern portion of the Urban Links golf center. A developer has recently proposed

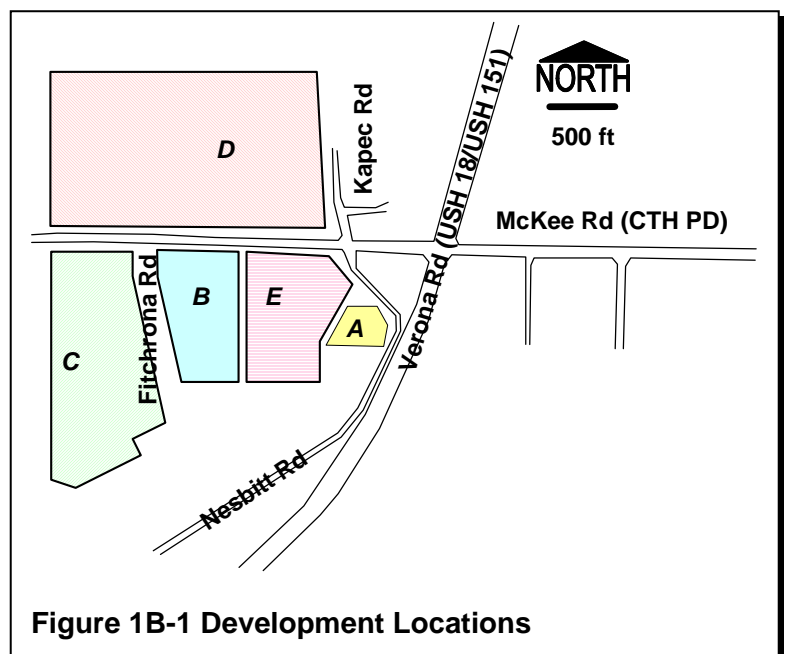


Figure 1B-1 Development Locations

assembling these properties and redeveloping the site into a larger regional retail center. This proposal may or may not move forward, yet there still remains the possibility that these parcels could redevelop into higher and more dense uses. The retail center has been proposed on land southwest of the McKee Road/Nesbitt Road intersection. For the purposes of this study, the redevelopment proposal has assumed 175,000 sq ft of retail and restaurant uses, including an anchor discount store and several outlots. This redevelopment could occur as soon as 2005.

- Development C lies south of McKee Road and where a quarry currently lies. A retail center and mixed-use development has been suggested on this site which lies directly west of Development E. An initial land use estimate provided by the owner includes 382,000 sq ft of retail and restaurant uses, 80,000 sq ft of office uses, and up to 50 dwelling units.
- Development A is located at the Jungs Garden Center. While this is an existing business and no development plans have been proposed, redevelopment into more dense land uses could potentially occur at some time in the future. For the purposes of this report, we estimated that this site could include 20,000 sq ft of retail/restaurant uses as well as an 80-room hotel (Development A).
- Redevelopment could potentially occur on the western portion of the Urban Links golf center (Development B). For the purposes of this report, we estimated that this site could include 50,000 sq ft of retail and about 45,000 sq ft of office uses (Development B).
- Redevelopment could occur at the quarry site north of McKee Road (Development D). For the purposes of this report, the study estimated a planned unit development with varying densities of residential homes, condos, and multifamily units totaling 656 dwelling units.

Again, these land uses and densities are merely assumptions that provided a basis for this study's evaluation of possible future development. Some were provided by prospective developers and land owners, while others were estimated from potential development demand. *The use of these assumptions does not constitute approval by the City for any development concepts, land uses, or densities.*

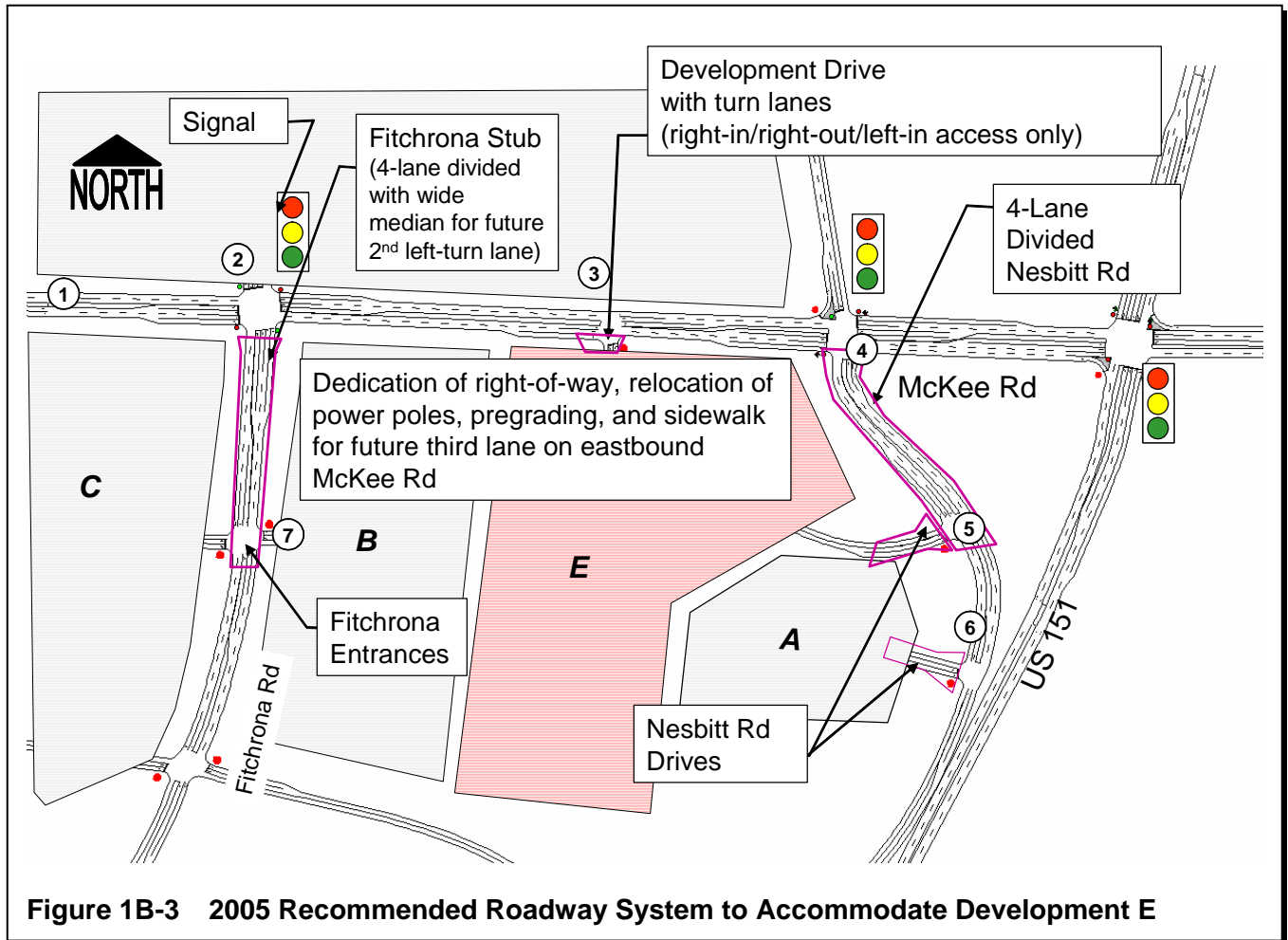
If these areas are developed according to the study assumptions, they will produce almost 2,200 trips during the PM peak hour. Figure 1B-2 breaks down these trips by development.

Development	PM Peak-Hour Trips
Development A	315
Development B	282
Development C	644
Development D	366
Development E	587
Total	2194

Figure 1B-2 Development Trips

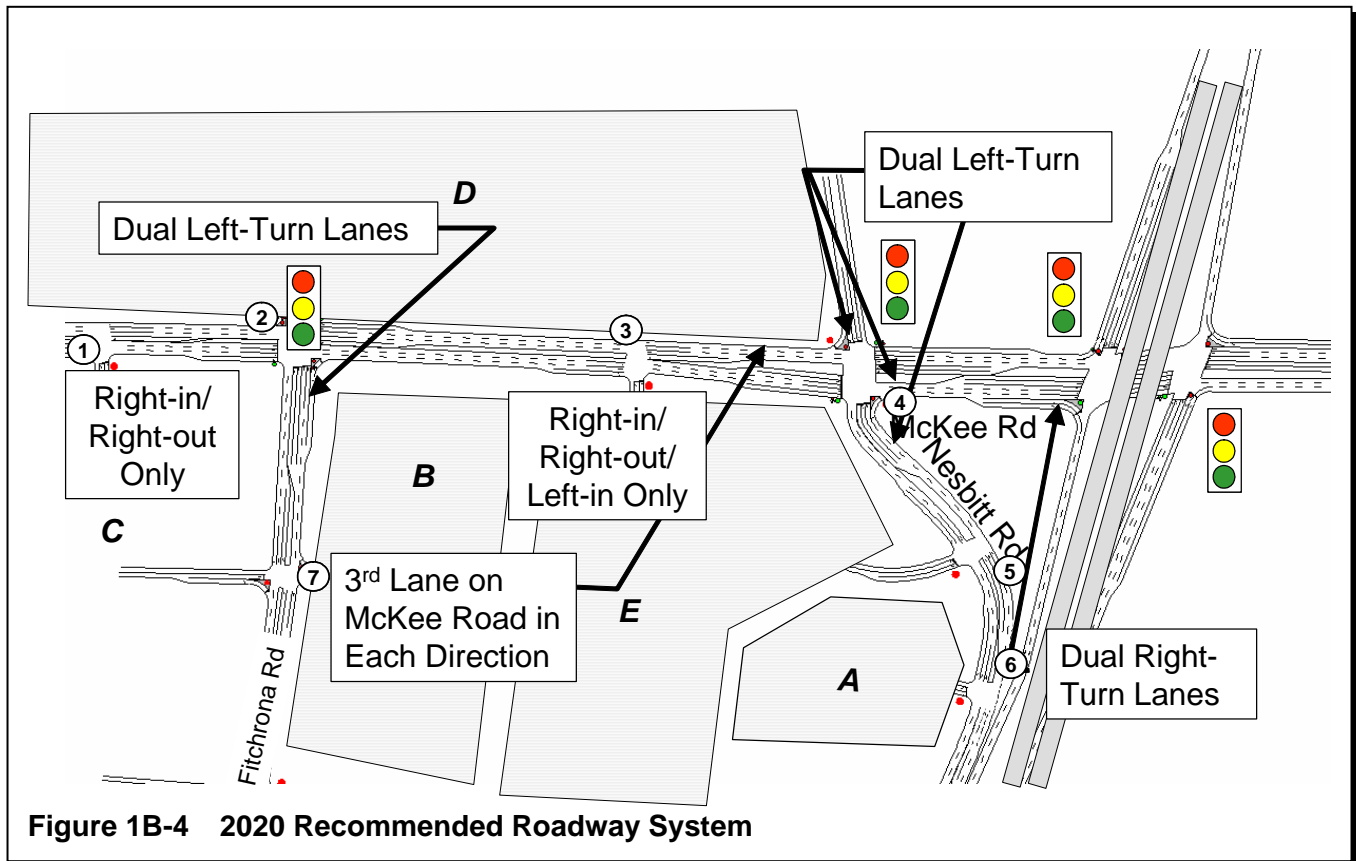
These potential developments and other area growth will create traffic demands that will require transportation improvements. Some of these transportation improvements would be needed to provide reasonable access to development properties. Other improvements will be needed to reduce the impact that area growth will have on the McKee Road corridor.

The study further assumed that Development E could occur before the other four potential developments. Figure 1B-3 summarizes the improvements recommended to accommodate only Development E in 2005. This report acknowledges that the construction of the Fitchrona Road stub is outside of the boundaries of Development E, and therefore the road's implementation may be delayed. An analysis of Development E traffic only shows that the Nesbitt Road/McKee Road intersection delays will be quite high without some of Development E's traffic being distributed to Fitchrona Road. These delays may be an unavoidable consequence of the staging of area development.



The transportation demands become more acute by 2020. Figure 1B-4 shows the year 2020 recommended improvements that accommodate background traffic growth as well as traffic from all five potential developments.

Sections 5 and 6 provide more detail on the extent of the improvements.



Even without any development in the study area, background traffic will create significant peak-hour transportation needs. Although roadway improvements can address some of these needs, unreasonably large roadway cross sections and intersection geometries would be necessary to maintain the levels of service that peak-hour traffic experiences today. Any additional development in the study area will produce further demands on the roadway network.

Excessive peak-hour delay is already common at many intersections in the Madison metropolitan area and is likely to become more common by 2020. Increased peak-hour delay will occur in the McKee Road corridor with or without these developments. Improvements can be implemented to mitigate some of these delays. Figure 1B-5 summarizes the anticipated levels of service for both existing conditions and the recommended future conditions.

	2004 Existing Conditions		2005 Recommended Access Cond w/ Development E		2020 Recommended Ultimate Conditions with Background and Total Development Traffic	
Intersection	Delay	LOS	Delay	LOS	Delay	LOS
1. McKee Rd/West Dev Drive					6	A
2. McKee Rd/Fitchrona Rd			6	A	28	C
3. McKee Rd/East Dev Drive			22	C	36	E
4. McKee Rd/Nesbitt Rd	31	C	55	D	54	D
Intersection	62	E	92	F	*	*
McKee Rd/SB Ramp					48	D
McKee Rd/NB Ramp					92	F
5. Nesbitt Rd/North Dev Drive			6	A	16	C
6. Nesbitt Rd/South Dev Drive					4	A
7. Fitchrona Rd/North Dev Drive					6	A

* An interchange is recommended at the McKee Road/Verona Road junction

Figure 1B-5 Projected Operating Conditions with Recommended Improvements

There are also other system-wide considerations that should become part of a longer range plan for the area. These considerations focus around pedestrian, bicycle and neighborhood connectivity. The following bullets summarize these considerations.

1. Pedestrian and bicycle crossing of McKee Road will grow in difficulty. At some point in the future, crossing McKee Road will be comparable to crossing University Ave, East Washington Ave, or Mineral Point Road. Additionally, providing pedestrian clearance time across McKee Road will decrease the amount of through green time given to motor vehicles. Ultimately a grade-separated ped/bike crossing should be considered, probably in the vicinity of Fitchrona Road
2. An east-west roadway that connects the Fitchrona Road extension to Nesbitt Road will probably be necessary to provide access to internal parcels. Additionally, this east-west roadway would provide a more direct alternative to McKee Road. This roadway is referred to as Nesbitt Crossing in this report.
3. These retail and residential developments analyzed in this report will be somewhat isolated from the eastern part of Fitchburg. As traffic grows on Verona Road and McKee Road, it will become more and more difficult to gain east-west access through the Verona Road/McKee Road interchange/intersection. Consideration should be given to providing a grade separated, motor vehicle crossing of Verona Road south of McKee Road. This could occur

with a future Nesbitt Crossing. Nesbitt Crossing would connect with Fitchrona Road, travel along the south edge of the developments discussed in this TIA, and ultimately cross US 151. Planning on the east side of Verona Road should consider a possible future connection.

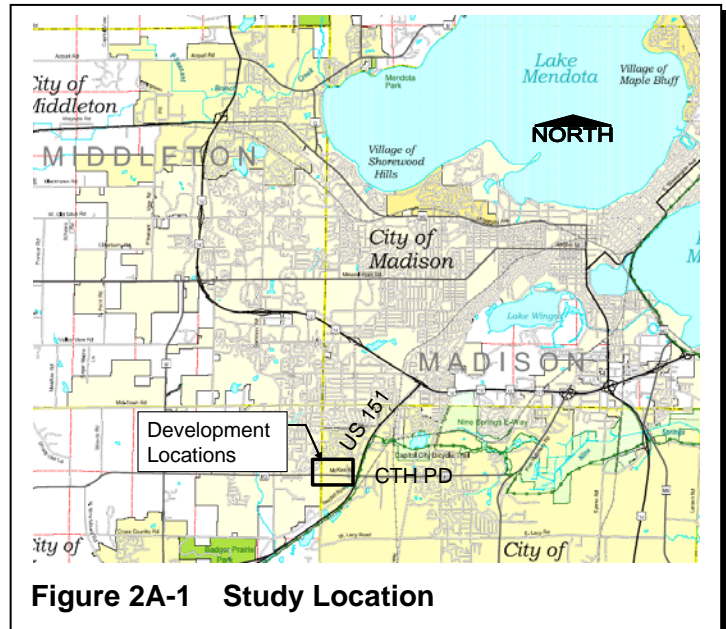
4. As the area develops, larger residential areas could occur north of McKee Road, and large retail areas south of McKee Road are being proposed by developers. Consideration should be given to ped/bike connections and systems that would link these two land-use types

SECTION 2
PROPOSED DEVELOPMENT

PART A. ON-SITE DEVELOPMENT

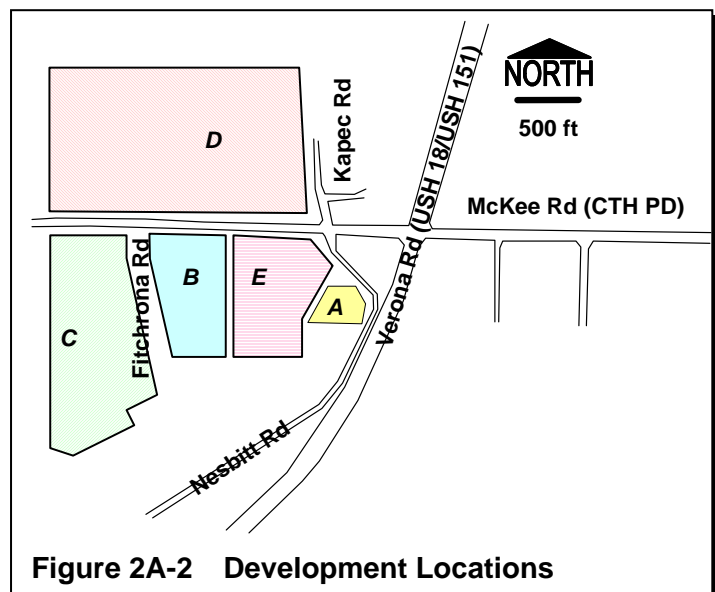
1. Development Description and Site Location

This TIA considers five potential “on-site” developments along McKee Road (CTH PD) and Nesbitt Road in the City of Fitchburg, Wisconsin. Some of the sites are already occupied by existing land uses which could be assembled and redeveloped into different uses and higher densities. The following paragraphs described the assumed redevelopment areas that were used for this report. These assumptions are for traffic analysis purposes only and do not constitute City approval of land use or density.



- A retail center has been proposed on land southwest of the McKee Road/Nesbitt Road intersection (Development E). This site currently houses a distributor (E.Z. Gregory), a tavern (Monkeyshines), a car service center (CarQuest) and the eastern portion of the Urban Links golf center.
- A retail center and mixed-use development is proposed on the quarry site south of McKee Road (Development C).
- At some point in the future, the opportunity for redevelopment to higher densities may exist at the Jungs Garden Center site west of Nesbitt Road (Development A).
- The opportunity for future redevelopment may exist on the western portion of the Urban Links site south of McKee Road (Development B).
- The opportunity for future redevelopment may exist at the quarry site north of McKee Road (Development D).

Figure 2A-2 shows the development locations in relation to each other.



2. Land Use and Intensity

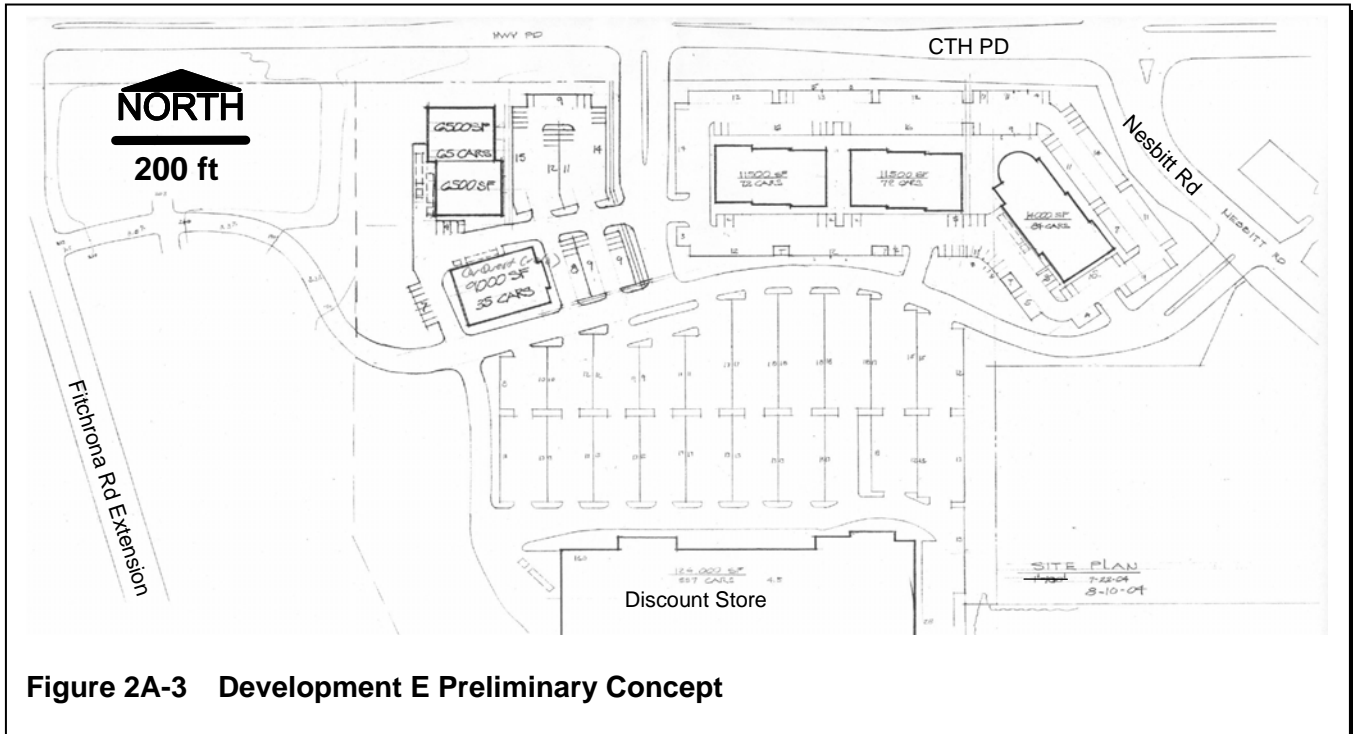
Two potential developers provided land use and square footage estimates for their proposed developments. For the remaining sites, Strand estimated possible land use and density in consultation with the City. Again, the following land use assumptions are for traffic analysis purposes only and do not constitute approval of land use or density.

- For this analysis, Development E includes a discount store (124,000 sq ft) and six outlots (59,000 sq ft total). This produces a floor-to-area ratio (FAR) of approximately 26 percent. The trip generation assumes that an existing on-site business (CarQuest) will not generate any new trips if it is relocated to an outlot, that one of the outlots will house a high-turnover sit-down restaurant (13,000 sq ft), and that the others will house specialty retail. Specialty retail has a lower trip-generation rate than a shopping center, which is similar but generally larger in scale.
- For this analysis, Development C includes a possible home improvement store (152,600 sq ft), a possible furniture store (120,000 sq ft), five outlots (100,000 sq ft total), general office (80,000 sq ft), and mixed use with retail (10,000 sq ft) and condominium (50 units) components. This produces a FAR of approximately 34 percent. The trip generation assumes that one of the outlots will house a high-turnover sit-down restaurant (10,000 sq ft) and that the others will house specialty retail. Specialty retail has a lower trip-generation rate than a shopping center, which is similar but generally larger in scale.
- Development A currently houses a Jungs garden center. At some point in the future, the site could be redeveloped more densely. For this traffic analysis, the study assumed that Development A could be redeveloped into a drive-in bank (5,000 sq ft), a high-turnover sit-down restaurant (15,000 sq ft), and a hotel (80 occupied rooms). This produces a FAR of approximately 33 percent.
- For this analysis, Development B was assumed to include a drive-in bank (5,000 sq ft) and mixed use with specialty retail (45,000 sq ft) and general office (45,000 sq ft) components. This produces a FAR of approximately 34 percent. Specialty retail has a lower trip-generation rate than a shopping center, which is similar but generally larger in scale.
- One possible Development D scenario includes 656 housing units on approximately 63 total acres for an average density of about 11 units per gross acre. The trip generation treats this mixture of low-, mid-, and high-density housing as a residential planned unit development (PUD).

These land uses and densities are merely assumptions that provided a basis for this study's evaluation of possible future development. Some were provided by prospective developers and land owners, while others were estimated from potential development demand. *The use of these assumptions does not constitute approval by the City for any development concepts, land uses, or densities.*

3. Site Plan

One potential developer provided a preliminary site plan, which is shown in Figure 2A-3. It proposes three access points: one on McKee Road, one on Nesbitt Road, and one on a future extension of Fitchrona Road.



McKee Road, Nesbitt Road, Kapec Road, and an extension of Fitchrona Road would provide access to the other potential developments.

4. Development Phasing and Timing

Full build-out of Development E could occur as early as late 2005 or early 2006. Timelines for the other developments are not known. This TIA uses a horizon year of 2020, which assumes completion of all five potential developments by 2015. The actual developments may differ substantially from the scenarios described in this report.

PART B. STUDY AREA

1. Influence Area

As noted in Section A, the five proposed and potential developments include retail, service, general office, and residential land uses.

Large discount retailers would attract trips from the south and southwest sides of the Madison metropolitan area. This influence area would include not only neighborhoods along McKee Road but also outlying communities along Verona Road (USH 18/USH151). The retail influence would diminish to the west, because there are competing facilities on the west side of the Madison metropolitan area. Restaurants, banks, and smaller retailers would generally attract linked trips, passby trips, and new trips from a limited geographic area. This smaller influence area would include neighborhoods along McKee Road.

Offices and residences would attract trips from throughout the Madison metropolitan area. Continued growth on the southwest side of the Madison metropolitan area, especially in the cities of Fitchburg, Madison, and Verona, could influence the area's extent and travel patterns.

2. Area of Significant Traffic Impact

At the City's direction, this TIA studies a portion of the McKee Road and Nesbitt Road corridors. This area of significant traffic impact includes:

- McKee Road from the western city limits east through its intersection with Verona Road.
- Nesbitt Road from the western city limits northeast through its intersection with McKee Road.

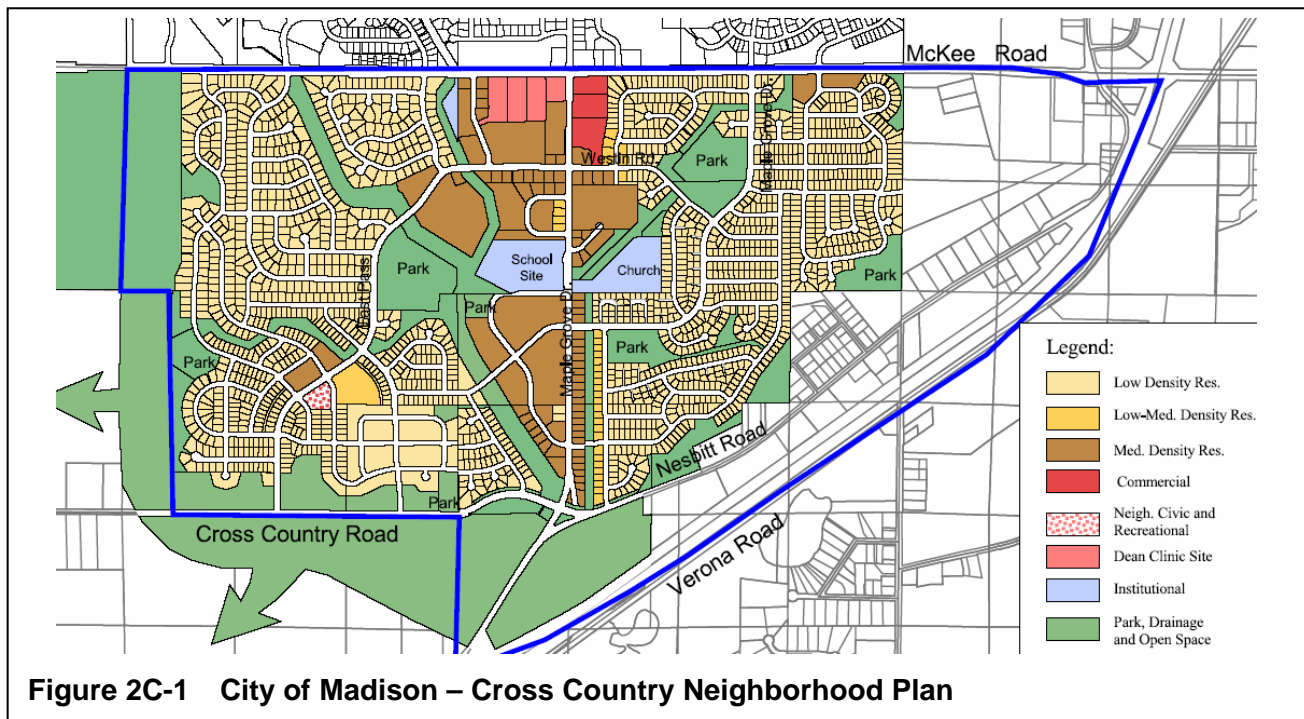
The study anticipates that the influence of the development traffic on McKee Road operations diminishes east of Verona Road.

This TIA analyzes the operation of:

- The Verona Road/McKee Road connection (intersection and/or interchange).
- McKee Road/Nesbitt Road intersection.
- McKee Road/Future Fitchrona Road extension.
- Development driveway intersections.

PART C. OFF-SITE LAND USE AND DEVELOPMENT

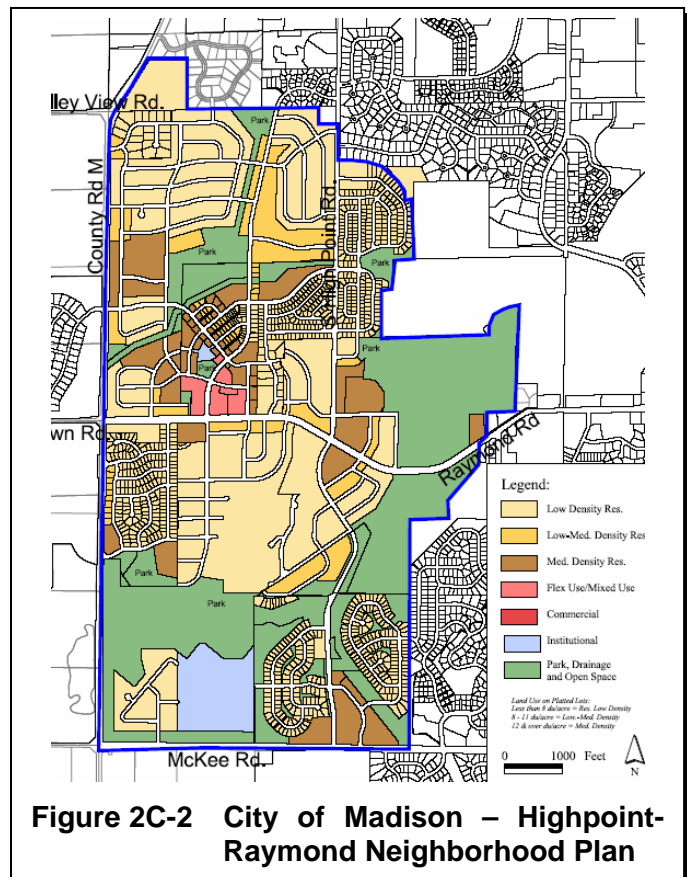
The cities of Fitchburg, Madison, and Verona are all experiencing growth, and the five "on-site" developments comprise only a portion of the developable and redevelopable land along the McKee Road and Nesbitt Road corridors. Vision 2020, which was completed in 1996, provided a longer range land use plan for Dane County. Actual growth on the southwest side of the Madison metropolitan area differs from the plan and already includes much of the developable land identified in Vision 2020. Vision 2020 did not foresee redevelopment for the study area and denoted land uses in the study area as existing development. This would assume continuation of the quarry operations in this corridor.



The City of Madison does have a neighborhood plan for the Cross Country neighborhood south of McKee Road and west of the study area. Figure 2C-1 shows the neighborhood plan, which envisions primarily residential development. As of September 2004, the neighborhood is about 80 percent built out.

The City of Madison also has a neighborhood plan for the Highpoint-Raymond neighborhood (Figure 2C-2), which is located further to the west. This plan also envisions primarily residential land uses.

The study used two methods to understand the effects of off-site land development on traffic within the study area. First, the study looked at historical traffic growth on McKee Road and assigned a 4 percent background growth to the study corridor. The Madison Area MPO also assigned development to the southwest Traffic Analysis Zones (TAZ's) in their TRANPLAN model and developed traffic assignments for McKee Road as well as Verona Road. The two methods produced similar results.



The study used the 4 percent background growth to account for other regional growth on the southwest side, inflating current traffic by 60 percent. Trips from the five developments were then added to these numbers. Chapter 4 describes this process more fully.

PART D. SITE ACCESSIBILITY

McKee Road (CTH PD) is an urban minor arterial that carries between 18,000 and 27,000 vehicles per day (vpd) near its intersection with Verona Road. It is a four-lane, mostly divided roadway from Maple Grove Road in the City of Madison east to Fish Hatchery Road (CTH D) in the City of Fitchburg.

Verona Road (USH 18/USH 151) is a principal arterial that carries between 30,000 and 40,000 vpd near its intersection with McKee Road. It is a four-lane urban expressway from McKee Road north to the Beltline Highway (USH 12/USH 14) and a four-lane rural freeway from McKee Road south past Verona. It is identified as a backbone route in the Corridors 2020 State Highway Plan.

In 2004, the Wisconsin Department of Transportation (WisDOT) released a Draft Environmental Impact Statement (DEIS) that examines improvement alternatives for the Verona Road corridor between the Beltline Highway and McKee Road. These alternatives include no-build, basic capacity expansion of the existing expressway, and construction of a regional freeflow facility and separate local road system. With the Urban Roadway alternative, McKee Road's junction with Verona Road would remain as a signalized intersection with additional turn and through lanes. With the freeway alternative, McKee Road's junction with Verona Road would be converted to a diamond interchange. North of the interchange, the two ramps would connect with one-way urban arterials, one southbound and one northbound.

Figure 2D-1 illustrates the connections associated with the two alternatives. The City of Fitchburg has expressed its support for the freeway alternative.



SECTION 3
ANALYSIS OF EXISTING CONDITIONS

PART A. PHYSICAL CHARACTERISTICS

The study area includes portions of McKee Road, Verona Road, Nesbitt Road/Kapec Road, Fitchrona Road, and the Military Ridge State Trail. Figure 3A-1 shows the relationship of the study roadways and intersections to the developments being proposed.

1. McKee Road

McKee Road (CTH PD) is a divided four-lane urban roadway with bicycle lanes. The speed limit is 40 mph with a 30 mph speed zone on the immediate west side of Verona Road. McKee Road enters the City near the crest of a ridge and then travels downhill (at a maximum grade of approximately 7 percent) to its intersection with Nesbitt Road and Kapec Road. Each approach of McKee Road has one left-turn lane and one right-turn lane; Nesbitt Road and Kapec Road each have one shared through/left-turn lane and one flared right-turn lane. The intersection is signalized; both left-turn movements from McKee Road have protected/permitted phasing. Figure 3A-2 shows a picture of McKee Road looking to the east.

From Nesbitt Road, McKee Road travels 650 feet to the east to its intersection with Verona Road. Each approach of McKee Road has one left-turn lane and one flared right-turn lane. The north approach of Verona Road has two left-turn lanes and one right-turn lane, and the south approach of Verona Road has one left-turn lane and one right-turn lane. The intersection is signalized; both left-turn movements from McKee Road have protected/permitted phasing, and both left-turn movements from Verona Road have protected-only phasing. The right-turn movement from eastbound McKee Road is stop-controlled, and the right-turn movement from westbound McKee Road is signalized. Crosswalks are provided on the south and east approaches.

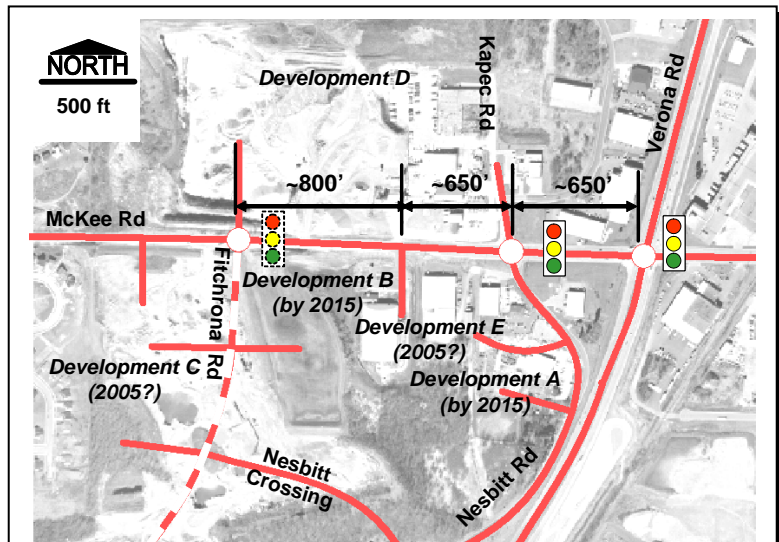


Figure 3A-1 Corridor Study Roadways



Figure 3A-2 McKee Road

From Verona Road, McKee Road continues to the east. An abandoned railroad crossing is located 600 feet from Verona Road, and the next signalized intersection is located 1,350 feet from Verona Road.

Figure 3A-3 shows the lane configurations of McKee Road's intersections with US 151 and Nesbitt Road.

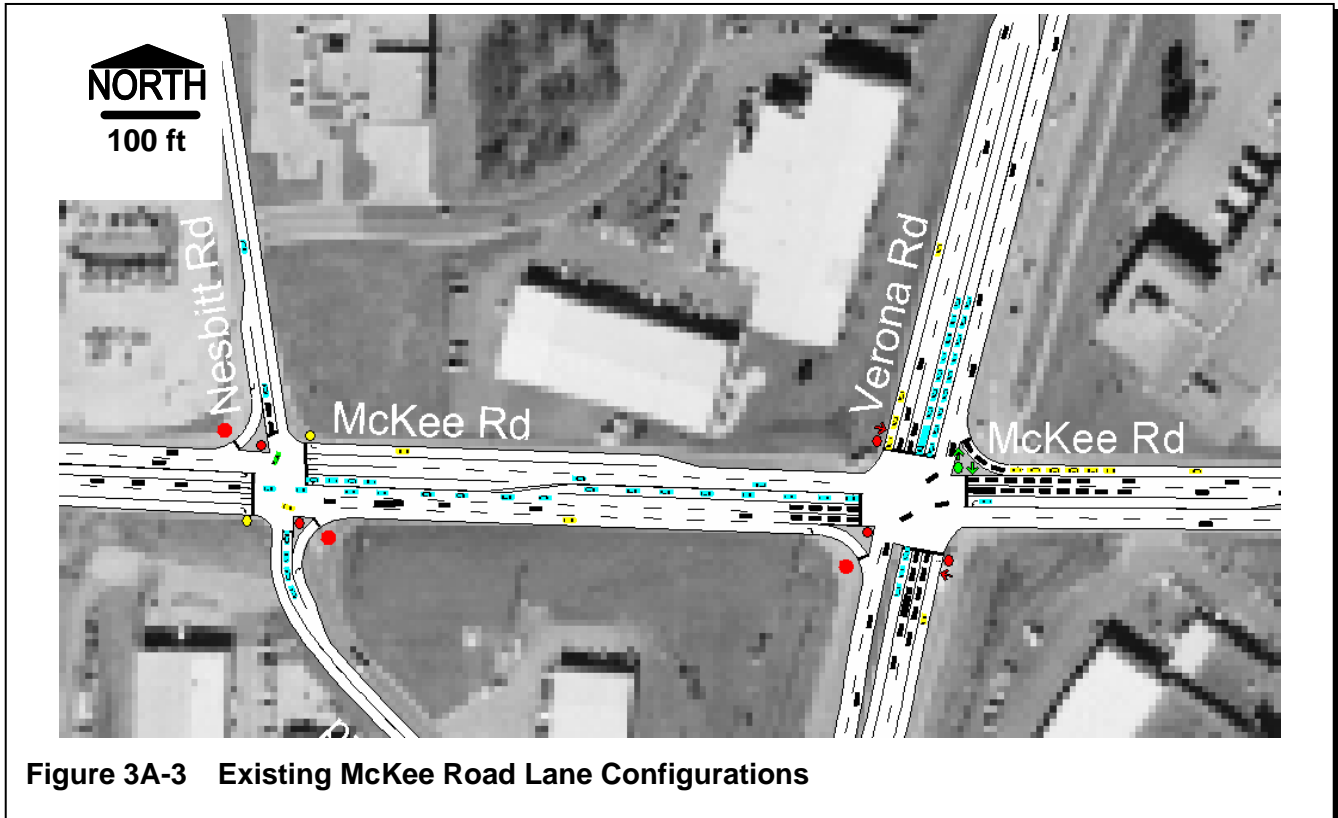


Figure 3A-3 Existing McKee Road Lane Configurations

2. Verona Road

Verona Road (USH 18/USH 151) is a divided four-lane expressway north of McKee Road and a divided four-lane freeway south of McKee Road. On the expressway and through the McKee Road intersection, the speed limit is 50 mph. South of the intersection, the speed limit is 65 mph.

In 2004, WisDOT released a Draft Environmental Impact Statement (DEIS) that examines improvement alternatives for the Verona Road corridor between the Beltline Highway and McKee Road. These alternatives include no-build, basic capacity expansion of the existing expressway (Urban Roadway Alternative), and construction of a regional freeflow facility and separate local road system (Freeway Alternative).

Figure 3A-4 schematically shows the two configurations being considered. The City of Fitchburg has expressed its support for the freeway alternative.

3. Nesbitt Road/Kapec Road

Kapec Road and Nesbitt Road are two-lane undivided urban streets that travel roughly parallel to Verona Road. Nesbitt Road has bicycle lanes. The speed limit is 30 mph.

4. Fitchrona Road

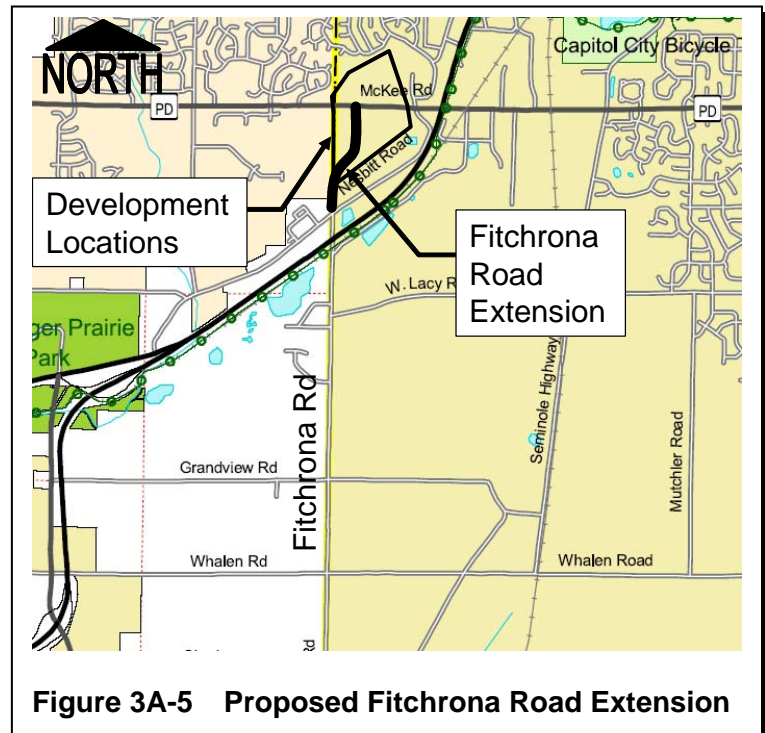
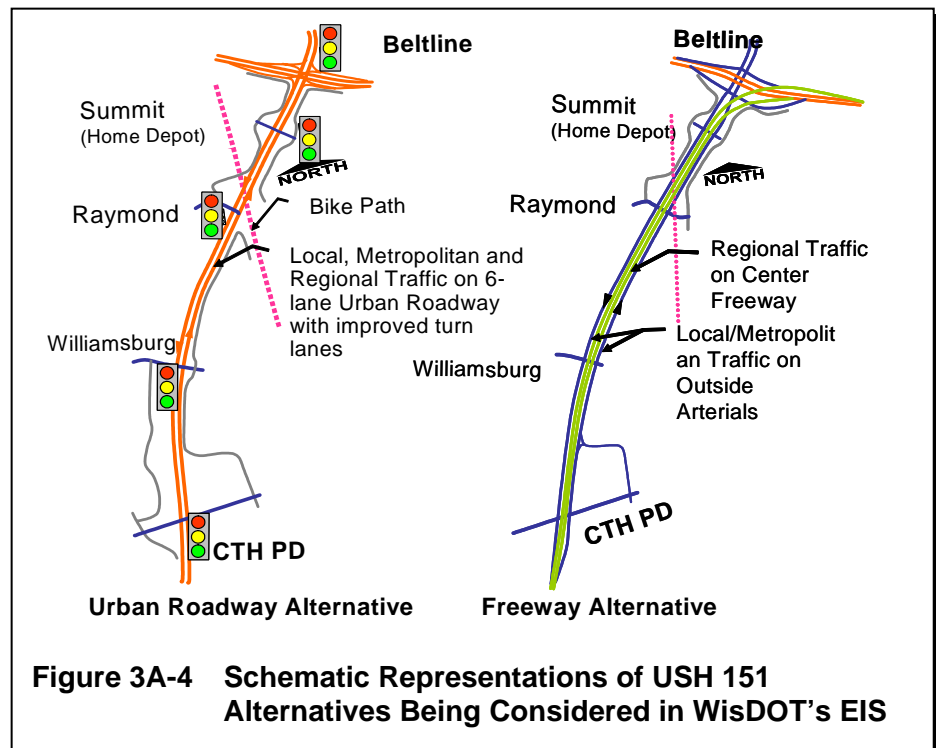
Fitchrona Road is a two-lane undivided transitional road that travels south from a T-intersection with Nesbitt Road. It passes under Verona Road and the Military Ridge State Trail, to which it has a connection. Development C includes the proposed extension of Fitchrona Road north-northeast to McKee Road. This extension is shown in Figure 3A-5.

5. Military Ridge State Trail

The Military Ridge State Trail begins just south of the Verona Road/McKee Road intersection and travels roughly parallel to Verona Road. This trail crosses the east approach of the Verona Road/McKee Road intersection.

6. Transit Service

The City of Fitchburg contracts with Metro Transit for limited bus service. Currently, Metro does not provide service to the study area, although its buses do use McKee Road to travel between routes. Metro provides more extensive service to neighborhoods west and north of the study area and is exploring a commuter bus route to and from the City of Verona.

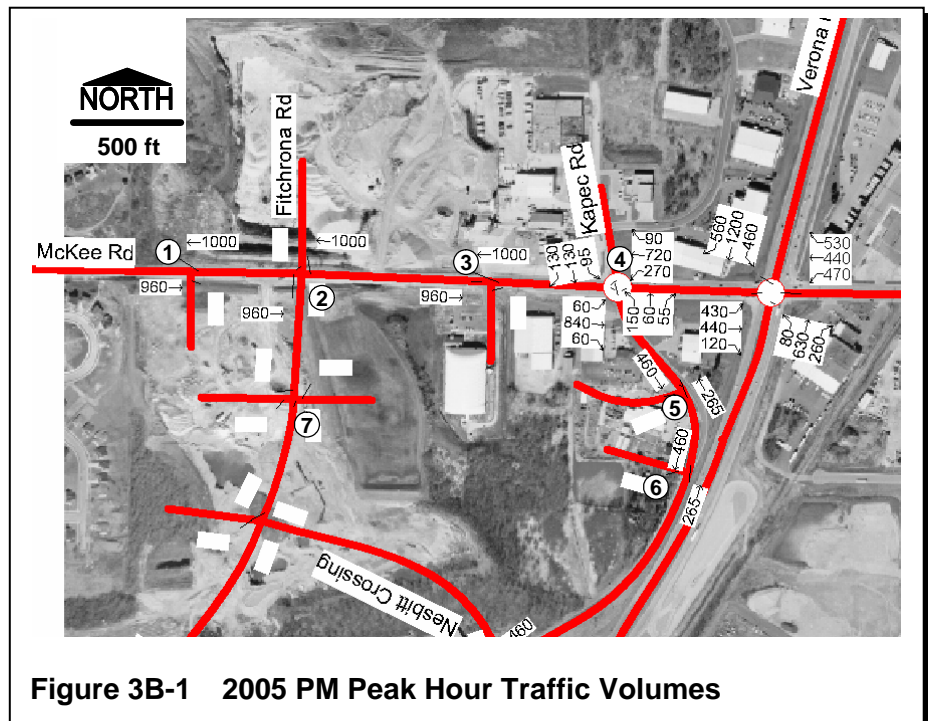


PART B. TRAFFIC VOLUMES

The most recent available average annual daily traffic volumes (AADT) are available from WisDOT's 2002 Wisconsin Highway Traffic Volume Data. In 2002, McKee Road carried 18,400 vpd west of Verona Road and 27,200 vpd east of Verona Road, Verona Road carried 39,600 vpd north of McKee Road, and Nesbitt Road carried 4,600 vpd south of McKee Road.

The proposed developments that are of key concern are primarily retail land uses that have few morning peak hour trips. Because of this, the TIA evaluates only PM peak-hour

operations. Figure 3B-1 shows 2005 PM peak-hour turning-movement counts at the McKee Road/Nesbitt Road/Kapece Road and McKee Road/Verona Road intersections. The volumes reflect multiple turning-movement counts, AADT counts, and AADT projections performed since 1996.



PART C. CAPACITY/LEVEL OF SERVICE

1. Level of Service

Level of Service (LOS) describes the operational effectiveness of a roadway. The LOS rating system ranges from LOS A (near ideal with no congestion) to LOS F (oversaturated with substantial congestion).

Intersection LOS is generally used to describe urban roadway operations. It relates to the average delay (in seconds) of all vehicles entering the intersection. Average delay is based on the peak 15-minute period of the peak travel hour. Since this delay is an average value, some vehicles experience substantially greater delay while others experience less delay. Intersections with short average delays have high LOS, while intersections with long average delays have low LOS. Typically, LOS D is acceptable, LOS E is marginal, and LOS F indicates the need for improvement.

LOS thresholds are different for signalized and unsignalized intersections. Because of driver expectancy and behavior, longer delays are more acceptable at signalized than at unsignalized intersections. For example, drivers at signalized intersections are able to relax during the red interval, while drivers on the minor approaches to an unsignalized intersection must remain attentive to identify acceptable gaps for entry.

Table 3C-1 describes LOS characteristics for signalized and unsignalized intersections.

LOS	Signalized Intersections	Unsignalized Intersections
A	Describes intersections with very low levels of delay that average less than 10 seconds per vehicle. This condition occurs with extremely favorable signal progression and most vehicles arrive on the green phase of the signal.	Describes intersections with very low levels of delay that average less than 10 seconds per vehicle.
B	Describes intersections with low levels of delay that are more than 10 seconds yet less than 20 seconds per vehicle. This condition generally occurs with short-cycle lengths and/or good signal progression.	Describes intersections with low levels of delay that are more than 10 seconds yet less than 15 seconds per vehicle.
C	Describes intersections with average delays ranging from 20 to 35 seconds per vehicle. Individual cycle failures (waiting through more than one cycle) may appear at this Level of Service. The number of vehicles stopping is also substantial at this Level of Service.	Describes intersections with average delays ranging from 15 to 25 seconds per vehicle.
D	Describes intersections with average delays ranging from 35 to 55 seconds per vehicle. The influence of congestion becomes more noticeable. This Level of Service may result from long-cycle lengths, unfavorable progression and/or high vehicle-to-capacity ratios. Many vehicles stop and the proportion of nonstopping vehicles declines. Individual cycle failures are noticeable.	Describes intersections with average delays ranging from 25 to 35 seconds per vehicle. The influence of congestion becomes more noticeable.
E	Describes intersections with average delays ranging from 55 to 80 seconds per vehicle. Individual cycle failures are frequent occurrences. This Level of Service is considered by most agencies to be the limit of acceptable delay.	Describes intersections with average delays ranging from 35 to 50 seconds per vehicle.
F	Describes intersections with average delays that are more than 80 seconds per vehicle. This Level of Service, considered to be unacceptable by most drivers, often occurs with oversaturation. The number of vehicles entering the intersection exceeds the intersection's capacity.	Describes intersections with average delays that are more than 50 seconds per vehicle. LOS F exists where there are insufficient gaps of suitable size to allow side-street traffic to cross safely through a major street traffic stream. This LOS is usually evident from extremely long total delays experienced by side-street traffic and queuing on the minor approaches.

Source: Highway Capacity Manual 2000

Table 3C-1 Intersection Level of Service (LOS) Characteristics

2. Existing Traffic Operating Conditions

Figure 3C-1 shows existing delay and LOS by movement and intersection. The study team evaluated roadway operations through SimTraffic 6 microsimulation of Synchro 6 networks. The results represent an average of data points from 9 separate microsimulation runs.¹

During the current PM peak-hour, the McKee Road/Nesbitt Road/Kapec Road intersection performs satisfactorily, while the McKee Road/Verona Road intersection performs marginally. All four left-turn movements at the McKee Road/Verona Road intersection operate with unsatisfactory delay.

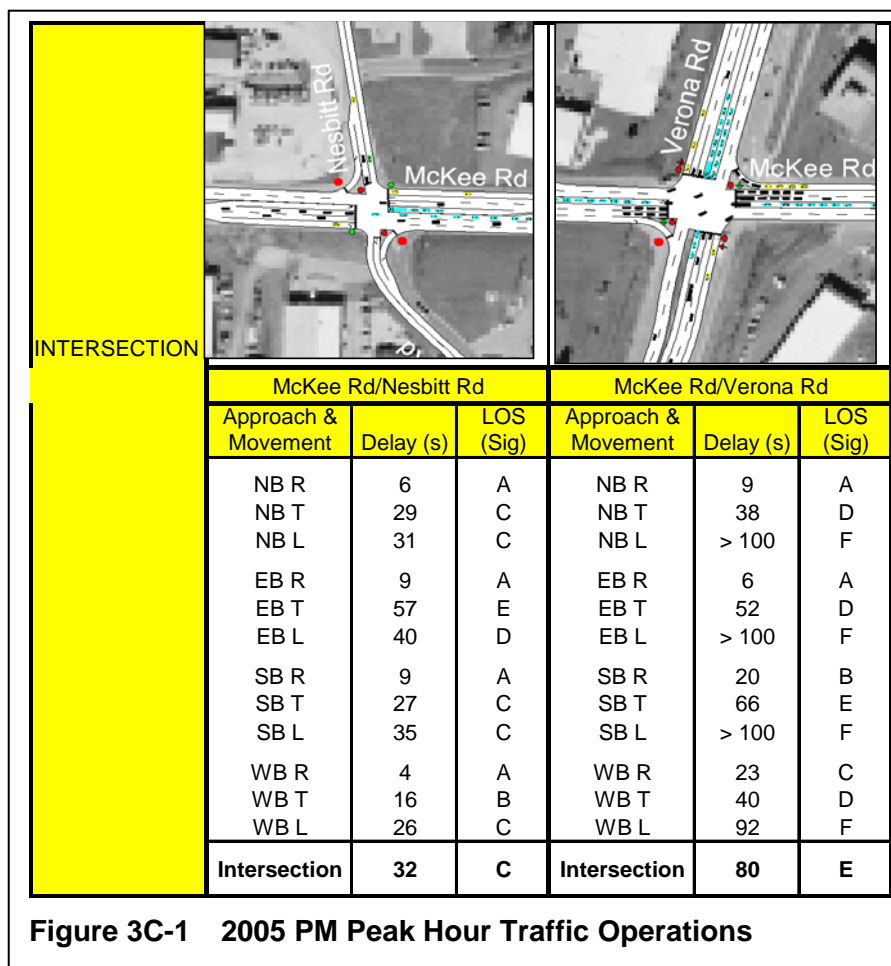


Figure 3C-1 2005 PM Peak Hour Traffic Operations

PART D. SOURCES OF DATA

Sources of data include:

- 2002 WisDOT Highway Traffic Volume Data
- City of Madison Planning Department – Neighborhood Plans
- WisDOT Verona Road/West Beltline Draft Environmental Impact Statement
- Madison Area Metropolitan Planning Organization (MPO) TranPlan Demand Model
- City of Madison Neighborhood Plans
- Turning-movement counts performed by Strand Associates, Inc., in 2004
- Development E Land Uses – Potential Developer
- Development C Land Uses – Potential Developer

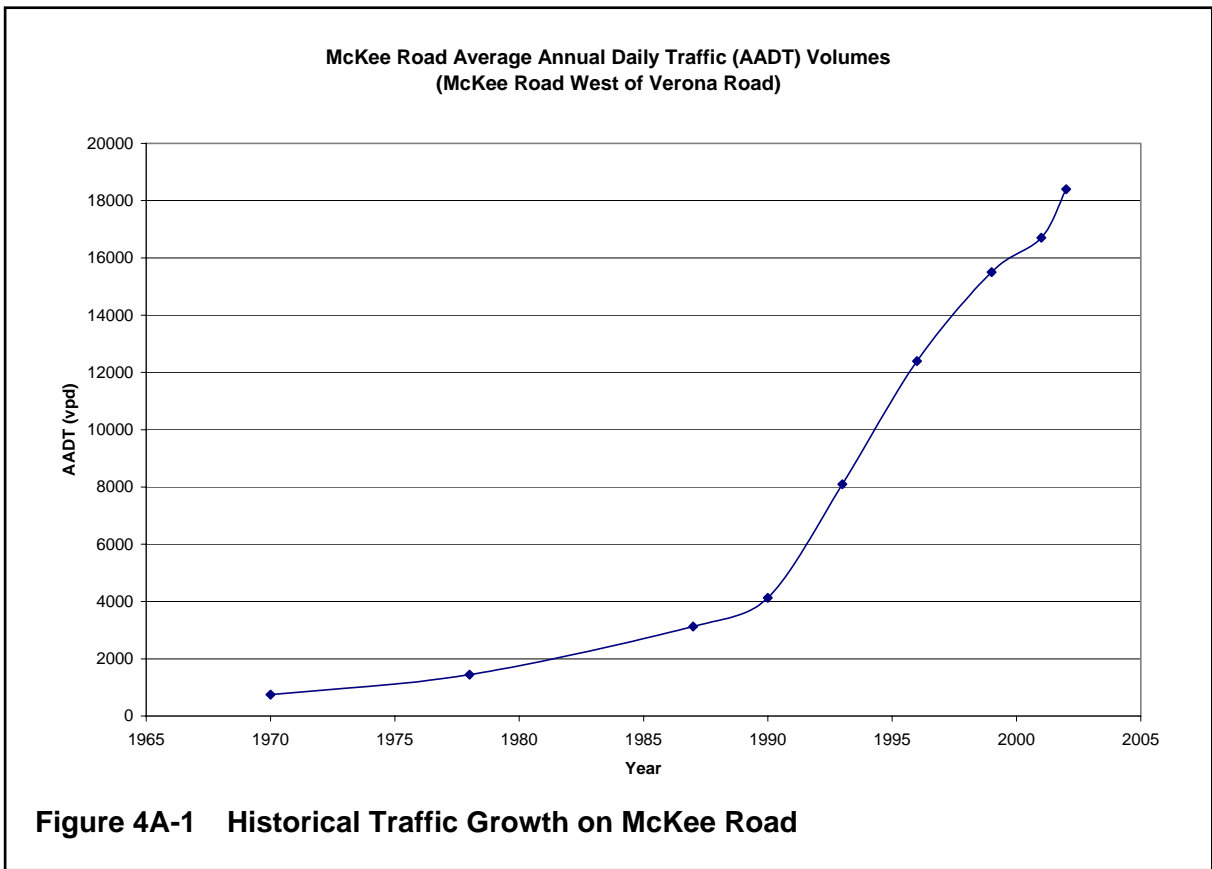
The land use assumptions stated in this report were made by the study team. They are for traffic analysis purposes only and do not constitute City approval of land use or density.

¹ The team found that removing the high and low data points and averaging the remaining 7 points did not tend to significantly affect the averages.

SECTION 4
PROJECTED TRAFFIC

PART A. NONSITE TRAFFIC FORECASTING

Figure 4A-1 shows average annual daily traffic volumes (AADT) on McKee Road west of Verona Road. The roadway carries about 1000 more vehicles per day (vpd) each year; traffic has more than quadrupled since 1990. In the same time, traffic on Nesbitt Road has doubled and traffic on Verona Road has increased by 30 to 50 percent.



Land use plans and development patterns suggest that the dramatic traffic growth of the last 15 years could continue through the next 15 years but at reduced rates as available development land diminishes.

One method used to project 2020 background traffic volumes was inflating base year volumes by 60 percent. This equates to 4 percent per year of the base volumes or twice the statewide average for traffic growth. The other method involved using the Madison Area MPO's TRANPLAN demand model. This model takes the metropolitan area's land uses and divides them up into Traffic Analysis Zones (TAZ). Trips from the TAZ's are distributed through a virtual roadway network to develop traffic assignments for the roadways. Projected 2020 land uses are entered into the TRANPLAN model, and 2020 traffic assignments are made.

When comparing the two methods, the Madison Area MPO's TranPlan demand model is generally more conservative. Between 2005 and 2020, it projects a 58 to 70 percent increase in background traffic (exclusive of the five developments) on McKee Road west of Verona Road, a 35 percent increase on Nesbitt Road, and a 2 to 7 percent increase on Verona Road. The lower growth for Verona Road represents a constrained roadway that is unable to accept additional traffic volume. The more modest projections can also be attributed in part to lower growth assumptions for communities like the City of Verona. Despite these differences, 2020 total intersection volumes projected by the two methods are within 20 percent of each other. For the purpose of this study, the 4 percent background growth method was used.¹ This growth is higher than the state-wide average traffic growth, but substantially less than what these corridors have been experiencing over the last 10 years.

Figure 4A-2 shows the traffic assignment for the 2020 PM peak hour.

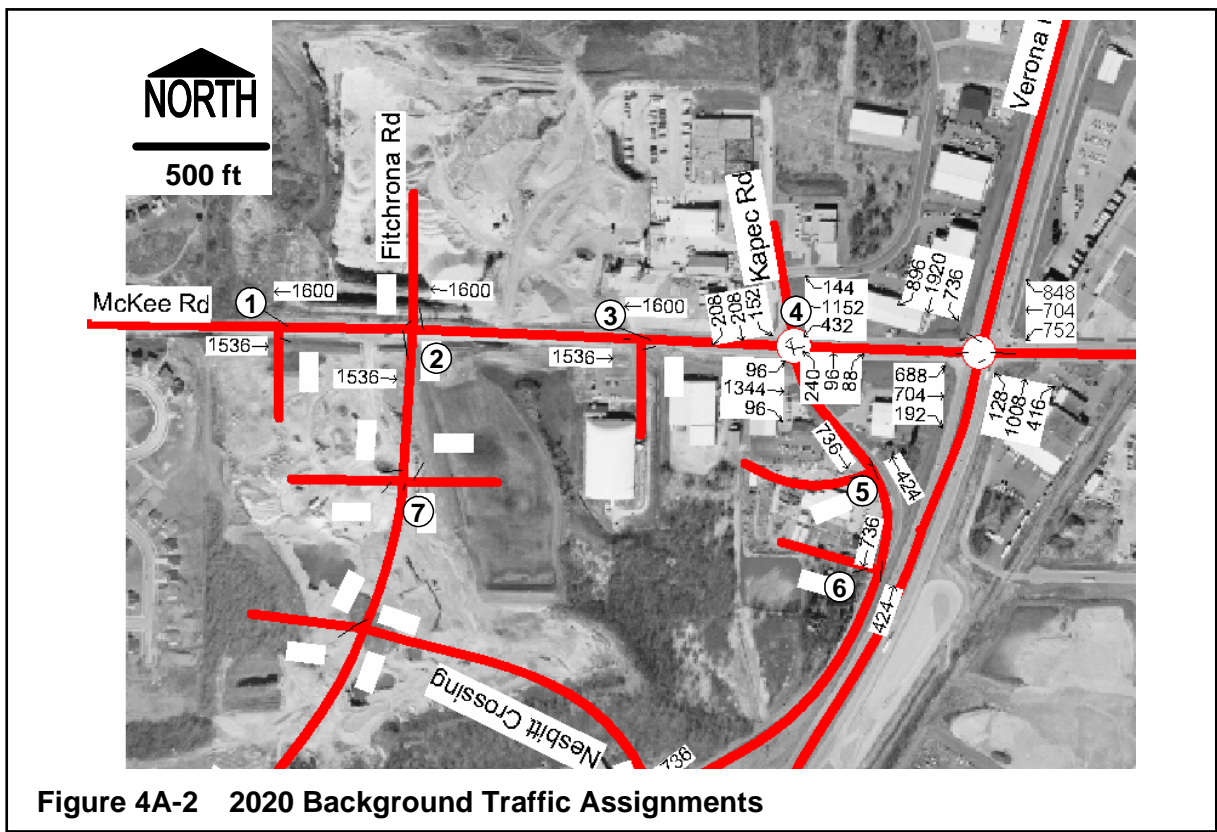


Figure 4A-2 2020 Background Traffic Assignments

¹ Even if the Verona Road demand exists, the projected peak-hour background volumes will be realized only with additional roadway capacity. Practically, only the Verona Road freeway alternative provides this capacity.

Since this study identifies transportation needs created by transportation demand, these volumes were not reduced to reflect capacity constraints. Therefore, similar background volumes were used for the two McKee Road/Verona Road intersection scenarios modeled (at-grade signalized intersection and grade-separated interchange).

For the grade-separated interchange scenario, the study translates the projected at-grade intersection turning movements to ramp intersection turning movements. It also adds the through volumes on the northbound and southbound ramps that were forecast as part of the Verona Road/West Beltline DEIS process, but it does not account for the effects of the freeway alternative on travel patterns.

PART B. SITE TRAFFIC FORECASTING

1. Trip Generation

Exhibit 4-1 at the back of this section shows the estimated PM peak-hour trip generation for the five “on-site” developments. The adjacent Figure 4B-1 provides a summary of the trips generated before and after reduction factors. The five developments will add more than 2000 PM peak-hour trips to the adjacent roadway network.

2. Mode Split

Because of the nature of the proposed developments and the current site characteristics, the study assumed a 100 percent motor vehicle split. Chapter 5 considers transit-, bicycle-, and pedestrian-oriented facilities, services, and design principles that could reduce this motor vehicle dependence.

Land Use (<i>Assumed for Study Only</i>)	ITE Code	Size	Unit	Rate	Total Trips
Development E					
Free-Standing Discount Store	815	124,000	1000 GFA	5.06	627
Specialty Retail Center (Outlot 1)	814	14,000	1000 GFA	2.71	38
Specialty Retail Center (Outlot 2)	814	11,500	1000 GFA	2.71	31
Specialty Retail Center (Outlot 3)	814	11,500	1000 GFA	2.71	31
High-Turnover (Sit-Down) Restaurant	932	13,000	1000 GFA	10.92	142
Total					870
Total with Pass-by and Linked Trip Reductions					587
Development A					
Drive-in Bank	912	5,000	1000 GFA	45.74	229
High-Turnover (Sit-Down) Restaurant	932	15,000	1000 GFA	10.92	164
Business Hotel	312	80	Rooms	0.62	50
Total					442
Total with Pass-by and Linked Trip Reductions					315
Development B					
Drive-in Bank	912	5,000	1000 GFA	45.74	229
Specialty Retail	814	45,000	1000 GFA	2.71	122
General Office Building	710	45,000	1000 GFA	1.49	67
Total					418
Total with Pass-by and Linked Trip Reductions*					282
Development C					
Home Improvement Superstore	862	152,600	1000 GFA	2.45	374
Furniture Store	890	120,000	1000 GFA	0.46	55
Specialty Retail Center	814	100,000	1000 GFA	2.71	271
General Office Building	710	80,000	1000 GFA	1.49	119
High-Turnover (Sit-Down) Restaurant	932	10,000	1000 GFA	10.92	109
Residential Condominium/Townhouse	230	50	DU	0.52	26
Total					954
Total with Pass-by and Linked Trip Reductions					644
Development D					
Planned Unit Development	270	656	DU	0.62	407
Total					407
Total with Pass-by and Linked Trip Reductions					366
Total Trips with Reductions					2,194

* See Exhibit 4-2 for pass by and linked trip reductions

Figure 4B-1 Trip Generation

3. Determination of Passby and Multi (Linked)-Trip Traffic

The study considered the potential for linked trips within each separate development. (Linked trips between developments were not treated explicitly but could be considered passby trips.) Traffic estimates for Developments B, C, and E reflect a 10 percent linked-trip discount, and the traffic estimate for Development A reflects a 5 percent linked-trip discount. The traffic estimate for Development D reflects a 10 percent discount for those trips that would access the site through neighborhood streets north of the study area.

After accounting for linked trips, the study segregated passby and nonpassby trips and distributed each separately. Based on a review of trip generation literature and site characteristics, the study assumed that passby trips would represent 25 percent of the PM peak-hour trip generation for Developments A, B, C, and E. The study assumed that Development D would have no passby trips.

Trip generation studies suggest a wide range of passby rates for retail uses. Some conclude that passby and diverted trips account for well over half of a retail development's PM peak-hour trip generation, whereas others conclude that these trips account for only a quarter. Most studies establish gross leasable floor area as the most reliable predictor of passby trip percentage, but they disagree as to whether this relationship is direct or inverse.²

In general, commuter-oriented facilities (such as banks, gas stations, and high-turnover restaurants) do tend to have high passby trip percentages and intense trip generation. Residential and office uses have a very small percentage of passby trips. Since the study area includes both Verona Road (a principal arterial) and McKee Road (a minor arterial), most diverted trips should be represented as passby trips. The comparatively few trips that divert to the developments from a point outside this study area should be represented as nonpassby trips.

While some passby trips may enter and leave the developments within the peak hour, others may only enter (and leave after the peak hour) or only exit (having entered before the peak hour). Because of slight variances in directional splits, distribution of and correction for the passby trips produce small changes to systemwide traffic volumes.

4. Trip Distribution

For the purposes of this study, a numbering system was used to define access points. The McKee Road entrance for development C is Access Point 1. The Fitchrona Road/McKee Road intersection is Access Point 2. The McKee Road entrance for Development E is Access Point 3. The McKee Road/Nesbitt Road intersection is Access Point 4 (even though it technically does not access a development.) Development E's access onto Nesbitt Road is Access Point 5. Development A's access onto Nesbitt Road is Access Point 6. And Development B's access onto Fitchrona Road is Access Point 7. This access point numbers are labeled on the graphics throughout the report.

The study team established trip distributions in consultation with the City. The study assumed that, of the PM peak-hour nonpassby trips to and from Developments A, B, C, and E:

² Passby trip studies include:

Johnson, Kevin L., and Matthew I Hammond, "Trip-Generation Characteristics for Convenience Stores," *ITE Journal*, August 2001.

Moussavi, Massoum, and Michael Gorman, "Refinement of Procedures Used for Estimating Pass-By Trip Percentages," *ITE Journal*, May 1992.

Moussavi, Massoum, and Michael Gorman, "A Study of Pass-By Trips Associated with Retail Developments," *ITE Journal*, March 1991.

Peyrebrune, Joan C, "Trip Generation Characteristics of Shopping Centers," *ITE Journal*, June 1996.

Smith, Steven A, "A Methodology for Consideration of Pass-By Trips in Traffic Impact Analyses for Shopping Centers," *ITE Journal*, August 1986.

- 35 percent will be oriented toward McKee Road (west).
- 20 percent will be oriented toward McKee Road (east).
- 25 percent will be oriented toward Verona Road (south).
- 10 percent will be oriented toward Verona Road (north).
- 10 percent will be oriented toward Nesbitt Road (southwest).

The study assumed a different trip distribution for Development D, which is largely residential. Of the PM peak-hour nonpassby trips to and from this development:

- 10 percent will be oriented toward McKee Road (west).
- 25 percent will be oriented toward McKee Road (east).
- 15 percent will be oriented toward Verona Road (south).
- 45 percent will be oriented toward Verona Road (north).
- 5 percent will be oriented toward Nesbitt Road (southwest).

The study assumed different inbound and outbound distributions for passby trips. Of the PM peak-hour passby trips to Developments A, B, C, and E:

- 20 percent will come from McKee Road (west).
- 20 percent will come from McKee Road (east).
- 15 percent will come from Verona Road (south).
- 40 percent will come from Verona Road (north).
- 5 percent will come from Nesbitt Road (southwest).

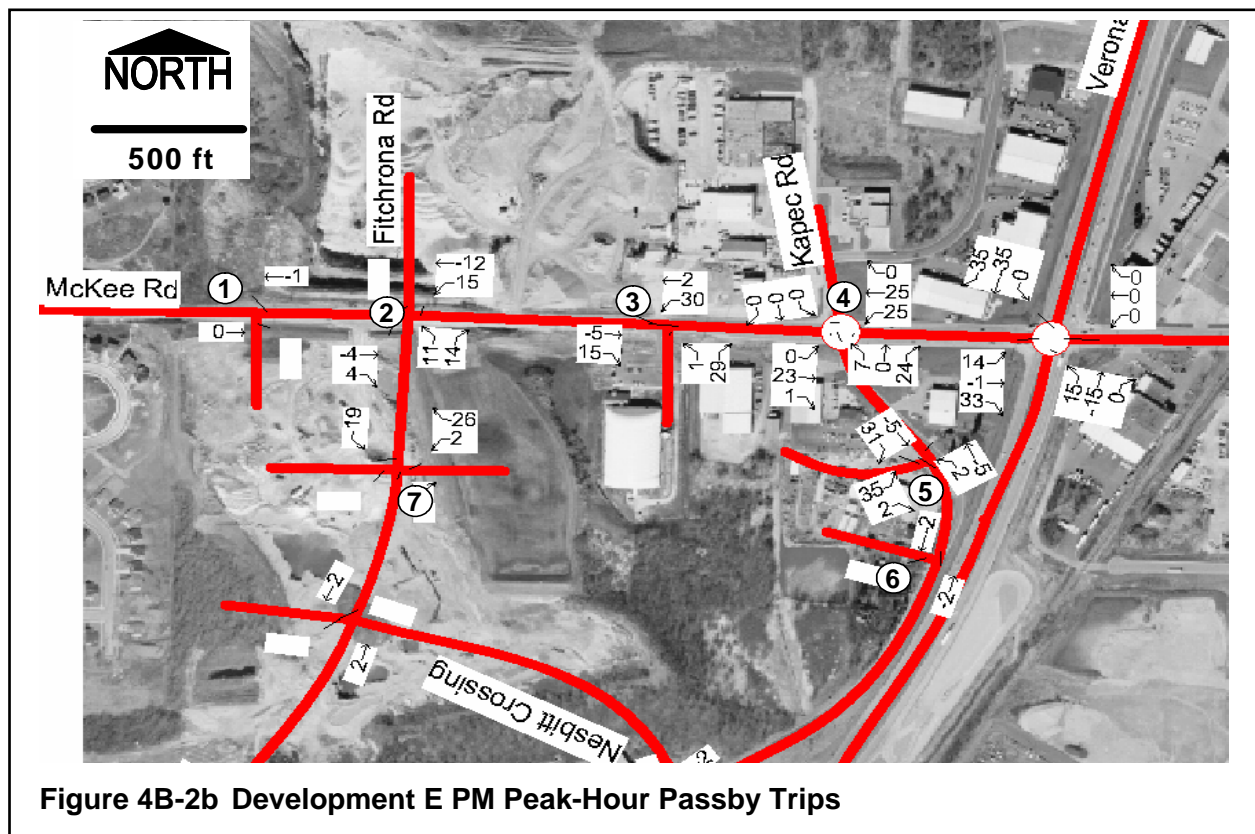
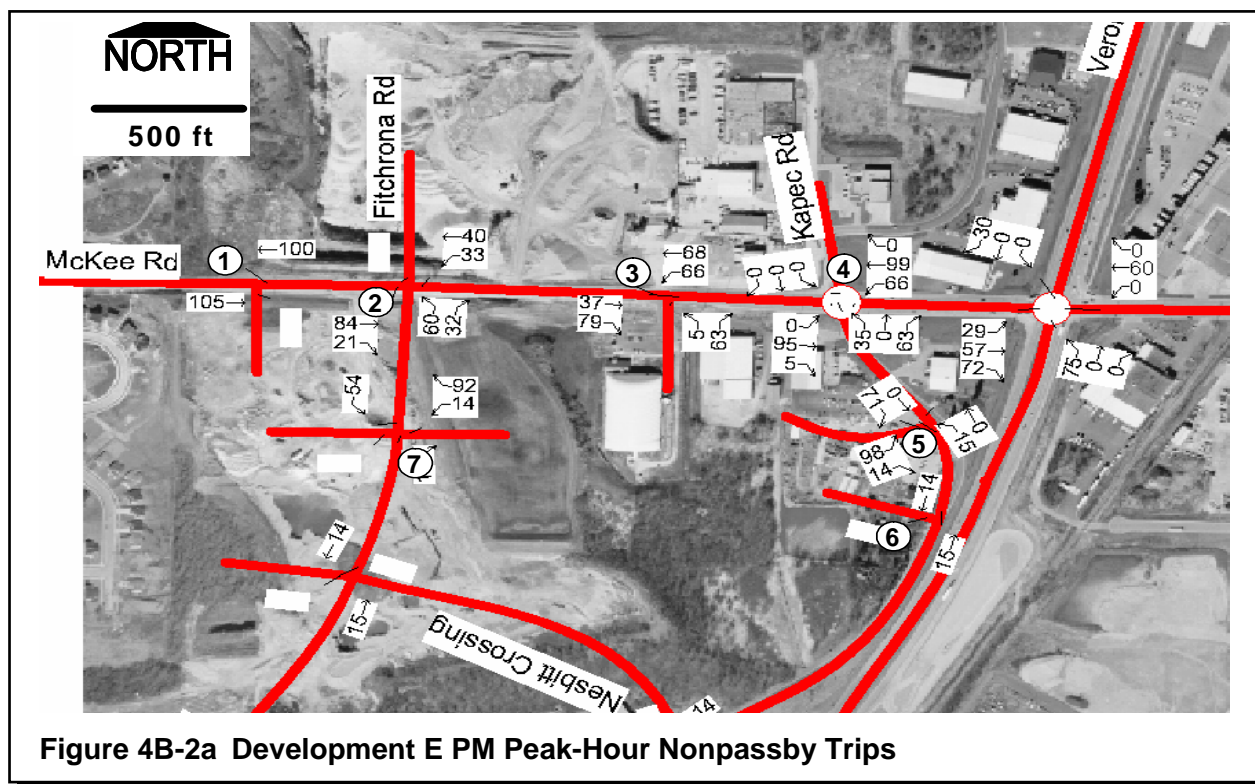
Of the PM peak-hour passby trips from Developments A, B, C, and E:

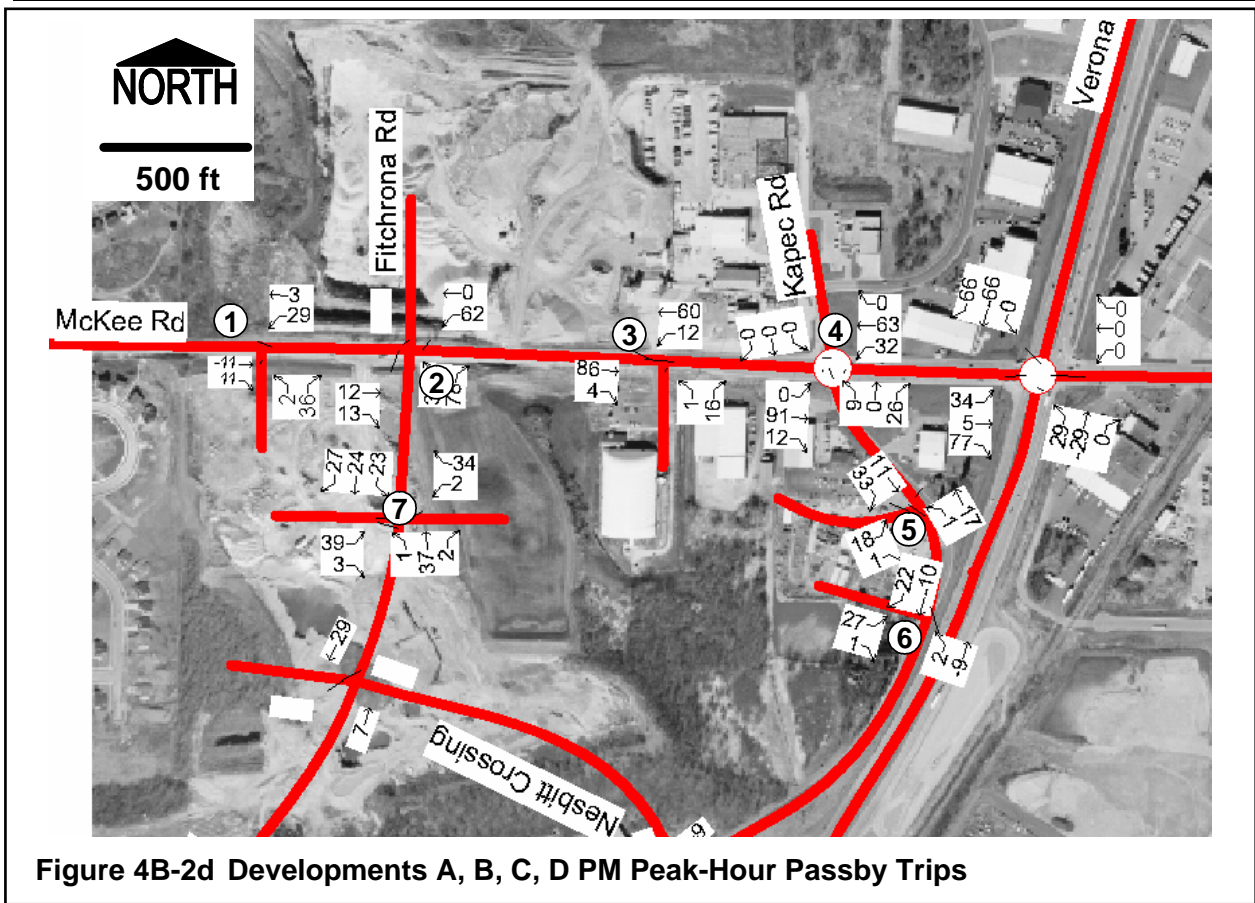
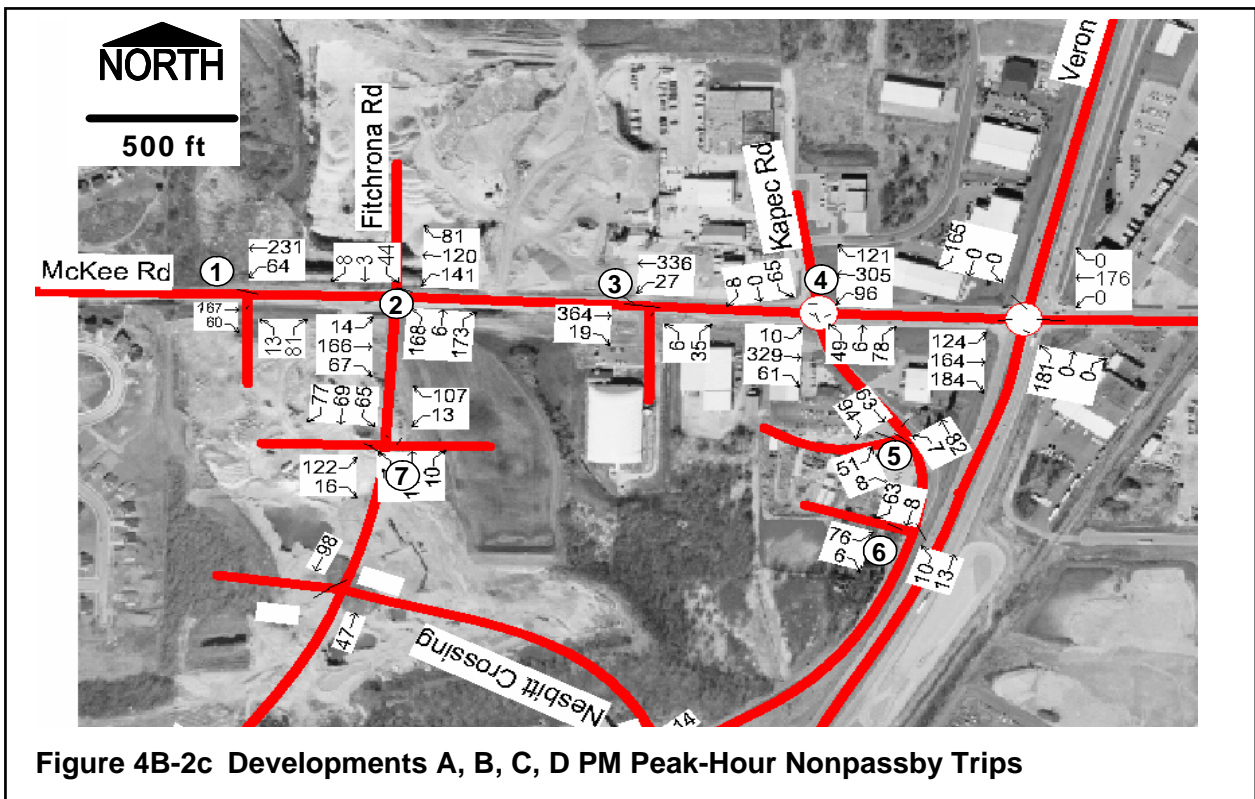
- 20 percent will depart to McKee Road (west).
- 20 percent will depart to McKee Road (east).
- 35 percent will depart to Verona Road (south).
- 20 percent will depart to Verona Road (north).
- 5 percent will depart to Nesbitt Road (southwest).

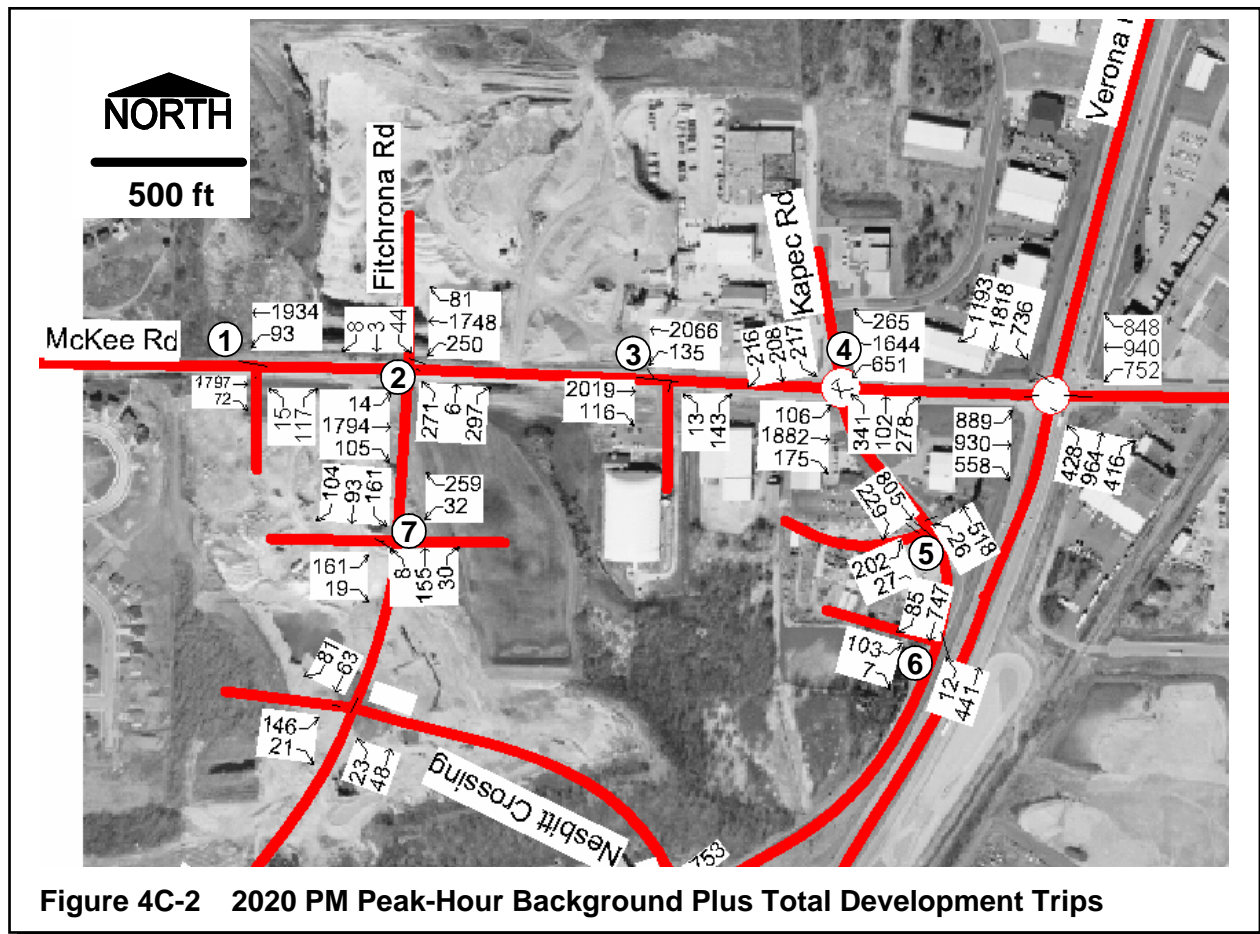
The study assumed that Development D will have no passby trips.

Developments C and E each have three access points, and Developments A, B, and D each have two access points. Trips were apportioned to these access points separately for each orientation and direction. For example, of the trips entering Development E from McKee Road (west), the study assumed that 5 percent will use the driveway on Nesbitt Road (Access Point 5), 75 percent will use the driveway on McKee Road (Access Point 3), and 20 percent will use the driveway on Fitchrona Road (Access Point 7).

Figures 4B-2a, 4B-2b, 4B-2c, and 4B-2d show the traffic assignment for the five “on-site” developments.







As Part A notes, these volumes are feasible only if capacity expansions occur. Without additional capacity, Verona Road and possibly McKee Road would be unable to carry the projected volumes at any level of service.

With development, total 2020 AADT could approach 50,000 to 65,000 vpd on Verona Road (north and south of McKee Road), 50,000 vpd on McKee Road, 18,000 vpd on Nesbitt Road (just south of McKee Road), and 8,000 vpd on Fitchrona Road (just south of McKee Road).

Trip Generation and Distribution for Development A (Jung Site)

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Exhibit 4-1A

Access Points

Nesbitt Rd Northern Driveway
Nesbitt Rd Southern Driveway

Development Assumptions

	Occ'd Rooms	Floor Area (sq ft)	Land Area/ Floor Area	Land Area (sq ft)
Site				200000
Bank		5000	3	15000
Restaurant		15000	3	45000
Hotel	80	46000	3	138000
Total				198000

Assume current Jungs trip generation is negligible. Therefore, do not reduce new trip generation.

Trip Generation (PM Peak Hour of Street Network)

Land Use	Code	Gross Floor Area (sq ft)	Trips per 1000 sq ft	Total Trips	% Inbound	% Outbound	Inbound Trips	Outbound Trips
Drive-in Bank	912	5000	45.74	229	50%	50%	114	114
High-Turnover (Sit-Down) Restaurant	932	15000	10.92	164	61%	39%	100	64
		Occ'd Rooms	Trips per Occ'd Rm					
Business Hotel	312	80	0.62	50	60%	40%	30	20
Subtotal 1				442			244	198
Linked Trip Reduction*				22			12	10
Subtotal 2				420			232	188
Passby Trip Reduction (see below)				105			58	47
Total				315			174	141

* Linked trip reduction: 5%

Inbound Trip Distribution

Origin	Total		Nesbitt Rd Northern Driveway*	Nesbitt Rd Southern Driveway*	Total		Nesbitt Rd Northern Driveway**	Nesbitt Rd Southern Driveway**
McKee Road (West)	35%		60%	40%	100%		21%	14%
Nesbitt Road (Southwest)	10%		40%	60%	100%		4%	6%
Verona Road (South)	25%		60%	40%	100%		15%	10%
Verona Road (North)	10%		60%	40%	100%		6%	4%
McKee Road (East)	20%		60%	40%	100%		12%	8%
Total	100%				Total		58%	42%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Outbound Trip Distribution

Destination	Total		Nesbitt Rd Northern Driveway*	Nesbitt Rd Southern Driveway*	Total		Nesbitt Rd Northern Driveway**	Nesbitt Rd Southern Driveway**
McKee Road (West)	35%		40%	60%	100%		14%	21%
Nesbitt Road (Southwest)	10%		60%	40%	100%		6%	4%
Verona Road (South)	25%		40%	60%	100%		10%	15%
Verona Road (North)	10%		40%	60%	100%		4%	6%
McKee Road (East)	20%		40%	60%	100%		8%	12%
Total	100%				Total		42%	58%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Inbound Trips (Excluding Passby)

Origin	Total				Nesbitt Rd Northern Driveway	Nesbitt Rd Southern Driveway
McKee Road (West)	61				37	24
Nesbitt Road (Southwest)	17				7	10
Verona Road (South)	43				26	17
Verona Road (North)	17				10	7
McKee Road (East)	35				21	14
Total	174				101	73

Outbound Trips (Excluding Passby)

Destination	Total			Nesbitt Rd Northern Driveway	Nesbitt Rd Southern Driveway
McKee Road (West)	49			20	30
Nesbitt Road (Southwest)	14			8	6
Verona Road (South)	35			14	21
Verona Road (North)	14			6	8
McKee Road (East)	28			11	17
Total	141			59	82

Inbound Passby Trip Distribution**Total Percent Inbound Passby: 25%**

Origin	% of Inbound Passby		Nesbitt Rd Northern Driveway*	Nesbitt Rd Southern Driveway*	Total		Nesbitt Rd Northern Driveway**	Nesbitt Rd Southern Driveway**
McKee Road (West)	20%		60%	40%	100%		3.0%	2.0%
Nesbitt Road (Southwest)	5%		40%	60%	100%		0.5%	0.8%
Verona Road (South)	15%		60%	40%	100%		2.3%	1.5%
Verona Road (North)	40%		60%	40%	100%		6.0%	4.0%
McKee Road (East)	20%		60%	40%	100%		3.0%	2.0%
Total	100%				Total		14.8%	10.3%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Outbound Passby Trip Distribution**Total Percent Outbound Passby: 25%**

Destination	% of Outbound Passby		Nesbitt Rd Northern Driveway*	Nesbitt Rd Southern Driveway*	Total		Nesbitt Rd Northern Driveway**	Nesbitt Rd Southern Driveway**
McKee Road (West)	20%		40%	60%	100%		2.0%	3.0%
Nesbitt Road (Southwest)	5%		60%	40%	100%		0.8%	0.5%
Verona Road (South)	35%		40%	60%	100%		3.5%	5.3%
Verona Road (North)	20%		40%	60%	100%		2.0%	3.0%
McKee Road (East)	20%		40%	60%	100%		2.0%	3.0%
Total	100%				Total		10.3%	14.8%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Inbound Passby Trips

Origin	Total			Nesbitt Rd Northern Driveway	Nesbitt Rd Southern Driveway
McKee Road (West)	12			7	5
Nesbitt Road (Southwest)	3			1	2
Verona Road (South)	9			5	3
Verona Road (North)	23			14	9
McKee Road (East)	12			7	5
Total	58			34	24

Outbound Passby Trips

Destination	Total			Nesbitt Rd Northern Driveway	Nesbitt Rd Southern Driveway
McKee Road (West)	9			4	6
Nesbitt Road (Southwest)	2			1	1
Verona Road (South)	16			7	10
Verona Road (North)	9			4	6
McKee Road (East)	9			4	6
Total	47			19	28

Trip Generation and Distribution for Development B (East of Nesbitt Crossing/Fitchrona Road) Exhibit 4-1B

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Access Points

Fitchrona Rd Driveway
McKee Rd Driveway (Flad)

Development Assumptions

		Floor Area (sq ft)	Land Area/ Floor Area	Land Area (sq ft)
Site				300000
Bank		5000	3	15000
Specialty Retail (first floor)		45000	3	135000
General Office (second floor)		45000	3	135000
Total				285000

Trip Generation (PM Peak Hour of Street Network)

Land Use	Code	Gross Floor Area (sq ft)	Trips per 1000 sq ft	Total Trips	% Inbound	% Outbound	Inbound Trips	Outbound Trips
Drive-in Bank	912	5000	45.74	229	50%	50%	114	114
Specialty Retail	814	45000	2.71	122	44%	56%	54	68
General Office Building	710	45000	1.49	67	17%	83%	11	56
				0			0	0
				0			0	0
				0			0	0
				0			0	0
Subtotal 1				418			179	238
Linked Trip Reduction*				42			18	24
Subtotal 2				376			161	214
Passby Trip Reduction (see below)				94			40	54
Total				282			121	161

* Linked trip reduction: 10%

Inbound Trip Distribution

Origin	Total		Fitchrona Rd Driveway*	McKee Rd Driveway (Flad)*	Total		Fitchrona Rd Driveway**	McKee Rd Driveway (Flad)**
McKee Road (West)	35%		60%	40%	100%		21%	14%
Nesbitt Road (Southwest)	10%		85%	15%	100%		9%	2%
Verona Road (South)	25%		60%	40%	100%		15%	10%
Verona Road (North)	10%		60%	40%	100%		6%	4%
McKee Road (East)	20%		60%	40%	100%		12%	8%
Total	100%				Total		63%	38%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Outbound Trip Distribution

Destination	Total		Fitchrona Rd Driveway*	McKee Rd Driveway (Flad)*	Total		Fitchrona Rd Driveway**	McKee Rd Driveway (Flad)**
McKee Road (West)	35%		95%	5%	100%		33%	2%
Nesbitt Road (Southwest)	10%		80%	20%	100%		8%	2%
Verona Road (South)	25%		60%	40%	100%		15%	10%
Verona Road (North)	10%		60%	40%	100%		6%	4%
McKee Road (East)	20%		60%	40%	100%		12%	8%
Total	100%				Total		74%	26%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Inbound Trips (Excluding Passby)

Origin	Total			Fitchrona Rd Driveway	McKee Rd Driveway (Flad)
McKee Road (West)	42			25	17
Nesbitt Road (Southwest)	12			10	2
Verona Road (South)	30			18	12
Verona Road (North)	12			7	5
McKee Road (East)	24			15	10
Total	121			76	45

Outbound Trips (Excluding Passby)

Destination	Total			Fitchrona Rd Driveway	McKee Rd Driveway (Flad)
McKee Road (West)	56			53	3
Nesbitt Road (Southwest)	16			13	3
Verona Road (South)	40			24	16
Verona Road (North)	16			10	6
McKee Road (East)	32			19	13
Total	161			119	41

Inbound Passby Trip Distribution

Total Percent Inbound Passby: 25%

Origin	% of Inbound Passby		Fitchrona Rd Driveway*	McKee Rd Driveway (Flad)*	Total		Fitchrona Rd Driveway**	McKee Rd Driveway (Flad)**
McKee Road (West)	20%		60%	40%	100%		3.0%	2.0%
Nesbitt Road (Southwest)	5%		85%	15%	100%		1.1%	0.2%
Verona Road (South)	15%		60%	40%	100%		2.3%	1.5%
Verona Road (North)	40%		60%	40%	100%		6.0%	4.0%
McKee Road (East)	20%		60%	40%	100%		3.0%	2.0%
Total	100%				Total		15.3%	9.7%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Outbound Passby Trip Distribution

Total Percent Outbound Passby: 25%

Destination	% of Outbound Passby		Fitchrona Rd Driveway*	McKee Rd Driveway (Flad)*	Total		Fitchrona Rd Driveway**	McKee Rd Driveway (Flad)**
McKee Road (West)	20%		95%	5%	100%		4.8%	0.3%
Nesbitt Road (Southwest)	5%		80%	20%	100%		1.0%	0.3%
Verona Road (South)	35%		60%	40%	100%		5.3%	3.5%
Verona Road (North)	20%		60%	40%	100%		3.0%	2.0%
McKee Road (East)	20%		60%	40%	100%		3.0%	2.0%
Total	100%				Total		17.0%	8.0%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Inbound Passby Trips

Origin	Total			Fitchrona Rd Driveway	McKee Rd Driveway (Flad)
McKee Road (West)	8			5	3
Nesbitt Road (Southwest)	2			2	0
Verona Road (South)	6			4	2
Verona Road (North)	16			10	6
McKee Road (East)	8			5	3
Total	40			25	16

Outbound Passby Trips

Destination	Total			Fitchrona Rd Driveway	McKee Rd Driveway (Flad)
McKee Road (West)	11			10	1
Nesbitt Road (Southwest)	3			2	1
Verona Road (South)	19			11	8
Verona Road (North)	11			6	4
McKee Road (East)	11			6	4
Total	54			36	17

Trip Generation and Distribution for Development C (West of Nesbitt Crossing)

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Exhibit 4-1C

Access Points

McKee Rd Driveway
Fitchrona Rd Northern Driveway
Fitchrona Rd Southern Driveway

Development Assumptions

	Units	Floor Area (sq ft)	Land Area/ Floor Area	Land Area (sq ft)
Site				1440000
Large Retail (Home Improvement Store)		152600	3	457800
Large Retail (Furniture Store)		120000	3	360000
Outlot Retail (5 lots)		100000	3	300000
General Office		80000	3	240000
Mixed Use -- Retail		10000	3	30000
Mixed Use -- Condo	50	30000	1	30000
Total				1417800

Trip Generation (PM Peak Hour of Street Network)

Land Use	Code	Gross Floor Area (sq ft)	Trips per 1000 sq ft	Total Trips	% Inbound	% Outbound	Inbound Trips	Outbound Trips
Home Improvement Superstore	862	152600	2.45	374	47%	53%	176	198
Furniture Store	890	120000	0.46	55	45%	55%	25	30
Specialty Retail Center	814	100000	2.71	271	44%	56%	119	152
General Office Building	710	80000	1.49	119	17%	83%	20	99
High-Turnover (Sit-Down) Restaurant	932	10000	10.92	109	61%	39%	67	43
		Units	Trips per Unit					
Residential Condominium/Townhouse	230	50	0.52	26	67%	33%	17	9
Subtotal 1				954			424	530
Linked Trip Reduction*				95			42	53
Subtotal 2				859			382	477
Passby Trip Reduction (see below)				215			95	119
Total				644			286	358

* Linked trip reduction: 10%

Inbound Trip Distribution

Origin	Total	McKee Rd Driveway*	Fitchrona Rd Northern Driveway*	Fitchrona Rd Southern Driveway*	Total	McKee Rd Driveway**	Fitchrona Rd Northern Driveway**	Fitchrona Rd Southern Driveway**
McKee Road (West)	35%	60%	30%	10%	100%	21%	11%	4%
Nesbitt Road (Southwest)	10%	5%	25%	70%	100%	1%	3%	7%
Verona Road (South)	25%	40%	30%	30%	100%	10%	8%	8%
Verona Road (North)	10%	40%	30%	30%	100%	4%	3%	3%
McKee Road (East)	20%	40%	30%	30%	100%	8%	6%	6%
Total	100%				Total	44%	30%	27%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Outbound Trip Distribution

Destination	Total	McKee Rd Driveway*	Fitchrona Rd Northern Driveway*	Fitchrona Rd Southern Driveway*	Total	McKee Rd Driveway**	Fitchrona Rd Northern Driveway**	Fitchrona Rd Southern Driveway**
McKee Road (West)	35%	10%	50%	40%	100%	4%	18%	14%
Nesbitt Road (Southwest)	10%	5%	45%	50%	100%	1%	5%	5%
Verona Road (South)	25%	40%	30%	30%	100%	10%	8%	8%
Verona Road (North)	10%	40%	30%	30%	100%	4%	3%	3%
McKee Road (East)	20%	40%	30%	30%	100%	8%	6%	6%
Total	100%				Total	26%	39%	36%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Inbound Trips (Excluding Passby)

Origin	Total	McKee Rd Driveway	Fitchrona Rd Northern Driveway	Fitchrona Rd Southern Driveway
McKee Road (West)	100	60	30	10
Nesbitt Road (Southwest)	29	1	7	20
Verona Road (South)	72	29	21	21
Verona Road (North)	29	11	9	9
McKee Road (East)	57	23	17	17
Total	286	125	84	77

Outbound Trips (Excluding Passby)

Destination	Total		McKee Rd Driveway	Fitchrona Rd Northern Driveway	Fitchrona Rd Southern Driveway
McKee Road (West)	125		13	63	50
Nesbitt Road (Southwest)	36		2	16	18
Verona Road (South)	90		36	27	27
Verona Road (North)	36		14	11	11
McKee Road (East)	72		29	21	21
Total	358		93	138	127

Inbound Passby Trip Distribution

Total Percent Inbound Passby: 25%

Origin	% of Inbound Passby	McKee Rd Driveway*	Fitchrona Rd Northern Driveway*	Fitchrona Rd Southern Driveway*	Total	McKee Rd Driveway**	Fitchrona Rd Northern Driveway**	Fitchrona Rd Southern Driveway**
McKee Road (West)	20%	60%	30%	10%	100%	3.0%	1.5%	0.5%
Nesbitt Road (Southwest)	5%	5%	25%	70%	100%	0.1%	0.3%	0.9%
Verona Road (South)	15%	40%	30%	30%	100%	1.5%	1.1%	1.1%
Verona Road (North)	40%	40%	30%	30%	100%	4.0%	3.0%	3.0%
McKee Road (East)	20%	40%	30%	30%	100%	2.0%	1.5%	1.5%
Total	100%				Total	10.6%	7.4%	7.0%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Outbound Passby Trip Distribution

Total Percent Outbound Passby: 25%

Destination	% of Outbound Passby	McKee Rd Driveway*	Fitchrona Rd Northern Driveway*	Fitchrona Rd Southern Driveway*	Total	McKee Rd Driveway**	Fitchrona Rd Northern Driveway**	Fitchrona Rd Southern Driveway**
McKee Road (West)	20%	10%	50%	40%	100%	0.5%	2.5%	2.0%
Nesbitt Road (Southwest)	5%	5%	45%	50%	100%	0.1%	0.6%	0.6%
Verona Road (South)	35%	40%	30%	30%	100%	3.5%	2.6%	2.6%
Verona Road (North)	20%	40%	30%	30%	100%	2.0%	1.5%	1.5%
McKee Road (East)	20%	40%	30%	30%	100%	2.0%	1.5%	1.5%
Total	100%				Total	8.1%	8.7%	8.3%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Inbound Passby Trips

Origin	Total		McKee Rd Driveway	Fitchrona Rd Northern Driveway	Fitchrona Rd Southern Driveway
McKee Road (West)	19		11	6	2
Nesbitt Road (Southwest)	5		0	1	3
Verona Road (South)	14		6	4	4
Verona Road (North)	38		15	11	11
McKee Road (East)	19		8	6	6
Total	95		40	28	27

Outbound Passby Trips

Destination	Total		McKee Rd Driveway	Fitchrona Rd Northern Driveway	Fitchrona Rd Southern Driveway
McKee Road (West)	24		2	12	10
Nesbitt Road (Southwest)	6		0	3	3
Verona Road (South)	42		17	13	13
Verona Road (North)	24		10	7	7
McKee Road (East)	24		10	7	7
Total	119		38	41	39

Trip Generation and Distribution for Development D (North of McKee Road)

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Exhibit 4-1D

Access Points

Fitchrona Rd
Kapec Rd

Development Assumptions

	Units/Acre	Acres	Units
Site		63	
Buildable Land (75%)		48	
Low-density housing	6	16	96
Mid-density housing	15	16	240
High-density housing	20	16	320
Total			656

Use linked trip reduction to account for trips using northern access to/from development.
Note different origin/destination split.

Trip Generation (PM Peak Hour of Street Network)

Land Use	Code	Units	Trips per Unit	Total Trips	% Inbound	% Outbound	Inbound Trips	Outbound Trips
Planned Unit Development	270	656	0.62	407	65%	35%	264	142
				0			0	0
				0			0	0
				0			0	0
				0			0	0
				0			0	0
				0			0	0
Subtotal 1				407			264	142
Linked Trip Reduction*				41			26	14
Subtotal 2				366			238	128
Passby Trip Reduction (see below)				0			0	0
Total				366			238	128

* Linked trip reduction: 10%

Inbound Trip Distribution

Origin	Total		Fitchrona Rd*	Kapec Rd*	Total		Fitchrona Rd**	Kapec Rd**
McKee Road (West)	10%		60%	40%	100%		6%	4%
Nesbitt Road (Southwest)	5%		50%	50%	100%		3%	3%
Verona Road (South)	15%		40%	60%	100%		6%	9%
Verona Road (North)	45%		40%	60%	100%		18%	27%
McKee Road (East)	25%		40%	60%	100%		10%	15%
Total	100%				Total		43%	58%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Outbound Trip Distribution

Destination	Total		Fitchrona Rd*	Kapec Rd*	Total		Fitchrona Rd**	Kapec Rd**
McKee Road (West)	10%		60%	40%	100%		6%	4%
Nesbitt Road (Southwest)	5%		50%	50%	100%		3%	3%
Verona Road (South)	15%		40%	60%	100%		6%	9%
Verona Road (North)	45%		40%	60%	100%		18%	27%
McKee Road (East)	25%		40%	60%	100%		10%	15%
Total	100%				Total		43%	58%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Inbound Trips (Excluding Passby)

Origin	Total			Fitchrona Rd	Kapec Rd
McKee Road (West)	24			14	10
Nesbitt Road (Southwest)	12			6	6
Verona Road (South)	36			14	21
Verona Road (North)	107			43	64
McKee Road (East)	59			24	36
Total	238			101	137

Outbound Trips (Excluding Passby)

Destination	Total			Fitchrona Rd	Kapec Rd
McKee Road (West)	13			8	5
Nesbitt Road (Southwest)	6			3	3
Verona Road (South)	19			8	12
Verona Road (North)	58			23	35
McKee Road (East)	32			13	19
Total	128			54	74

Inbound Passby Trip Distribution

Total Percent Inbound Passby: 0%

Origin	% of Inbound Passby		Fitchrona Rd*	Kapec Rd*	Total		Fitchrona Rd**	Kapec Rd**
McKee Road (West)	20%		60%	40%	100%		0.0%	0.0%
Nesbitt Road (Southwest)	5%		50%	50%	100%		0.0%	0.0%
Verona Road (South)	15%		40%	60%	100%		0.0%	0.0%
Verona Road (North)	40%		40%	60%	100%		0.0%	0.0%
McKee Road (East)	20%		40%	60%	100%		0.0%	0.0%
Total	100%				Total		0.0%	0.0%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Outbound Passby Trip Distribution

Total Percent Outbound Passby: 0%

Destination	% of Outbound Passby		Fitchrona Rd*	Kapec Rd*	Total		Fitchrona Rd**	Kapec Rd**
McKee Road (West)	20%		60%	40%	100%		0.0%	0.0%
Nesbitt Road (Southwest)	5%		50%	50%	100%		0.0%	0.0%
Verona Road (South)	35%		40%	60%	100%		0.0%	0.0%
Verona Road (North)	20%		40%	60%	100%		0.0%	0.0%
McKee Road (East)	20%		40%	60%	100%		0.0%	0.0%
Total	100%				Total		0.0%	0.0%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Inbound Passby Trips

Origin	Total			Fitchrona Rd	Kapec Rd
McKee Road (West)	0			0	0
Nesbitt Road (Southwest)	0			0	0
Verona Road (South)	0			0	0
Verona Road (North)	0			0	0
McKee Road (East)	0			0	0
Total	0			0	0

Outbound Passby Trips

Destination	Total			Fitchrona Rd	Kapec Rd
McKee Road (West)	0			0	0
Nesbitt Road (Southwest)	0			0	0
Verona Road (South)	0			0	0
Verona Road (North)	0			0	0
McKee Road (East)	0			0	0
Total	0			0	0

Trip Generation and Distribution for Development E (Southwest of McKee Road/Nesbitt Road) Exhibit 4-1E

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Access Points

Nesbitt Rd Driveway
McKee Rd Driveway
Fitchrona Rd Driveway

Development Assumptions

Land uses and floor areas are from a 10 August 2004 development proposal.

Site plan also includes relocated CarQuest. Because this generator already exists and is relatively minor, it is not included in the trip generation.

Trip Generation (PM Peak Hour of Street Network)

Land Use	Code	Gross Floor Area (sq ft)	Trips per 1000 sq ft	Total Trips	% Inbound	% Outbound	Inbound Trips	Outbound Trips
Free-Standing Discount Store	815	124000	5.06	627	50%	50%	314	314
Specialty Retail Center (Outlot 1)	814	14000	2.71	38	44%	56%	17	21
Specialty Retail Center (Outlot 2)	814	11500	2.71	31	44%	56%	14	17
Specialty Retail Center (Outlot 3)	814	11500	2.71	31	44%	56%	14	17
High-Turnover (Sit-Down) Restaurant	932	13000	10.92	142	61%	39%	87	55
				0			0	0
				0			0	0
Subtotal 1				870			444	425
Linked Trip Reduction*				87			44	43
Subtotal 2				783			400	383
Passby Trip Reduction (see below)				196			100	96
Total				587			300	287

* Linked trip reduction: 10%

Inbound Trip Distribution

Origin	Total	Nesbitt Rd Driveway	McKee Rd Driveway	Fitchrona Rd Driveway	Total	Nesbitt Rd Driveway*	McKee Rd Driveway*	Fitchrona Rd Driveway*
McKee Road (West)	35%	5%	75%	20%	100%	2%	26%	7%
Nesbitt Road (Southwest)	10%	50%	0%	50%	100%	5%	0%	5%
Verona Road (South)	25%	40%	40%	20%	100%	10%	10%	5%
Verona Road (North)	10%	40%	40%	20%	100%	4%	4%	2%
McKee Road (East)	20%	40%	40%	20%	100%	8%	8%	4%
Total	100				Total	29	48%	23%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Outbound Trip Distribution

Destination	Total	Nesbitt Rd Driveway	McKee Rd Driveway	Fitchrona Rd Driveway	Total	Nesbitt Rd Driveway*	McKee Rd Driveway*	Fitchrona Rd Driveway*
McKee Road (West)	35%	35%	5%	60%	100%	12%	2%	21%
Nesbitt Road (Southwest)	10%	50%	0%	50%	100%	5%	0%	5%
Verona Road (South)	25%	40%	40%	20%	100%	10%	10%	5%
Verona Road (North)	10%	40%	40%	20%	100%	4%	4%	2%
McKee Road (East)	20%	40%	40%	20%	100%	8%	8%	4%
Total	100				Total	39	24%	37%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Inbound Trips (Excluding Passby)

Origin	Total	Nesbitt Rd Driveway	McKee Rd Driveway	Fitchrona Rd Driveway
McKee Road (West)	105	5	79	21
Nesbitt Road (Southwest)	30	15	0	15
Verona Road (South)	75	30	30	15
Verona Road (North)	30	12	12	6
McKee Road (East)	60	24	24	12
Total	300	86	145	69

Out bound Trips(Excl uding Passby)

Dest hat on	Tot al		Nesbt t Rd Driveway	McKeeRd Driveway	Ft chr ona Rd Driveway
McKee Road (West)	100		35	5	60
Nesbitt Road (Southwest)	29		14	0	14
Verona Road (South)	72		29	29	14
Verona Road (North)	29		11	11	6
McKee Road (East)	57		23	23	11
Tot al	287		113	68	106

Inbound PassbyTri p Dist r but on

Total		Per cent	Inbound Passby						25 %
Origin		% of Inbound Passby	Nesbitt Rd Driveway	McKeeRd Driveway	Ft chona Rd Driveway	Total	Nesbitt Rd Driveway*	McKeeRd Driveway*	Ft chona Rd Driveway*
McKee Road (West)		20%	5%	75%	20%	100%	0.3%	3.8%	1.0%
Nesbitt Road (Southwest)		5%	50%	0%	50%	100%	0.6%	0.0%	0.6%
Verona Road (South)		15%	40%	40%	20%	100%	1.5%	1.5%	0.8%
Verona Road (North)		40%	40%	40%	20%	100%	4.0%	4.0%	2.0%
McKee Road (East)		20%	40%	40%	20%	100%	2.0%	2.0%	1.0%
Total		100				Total	8.4%	11%	5.4%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Out bound PassbyTri p Dist r but on

Out bound Passby Percentage		25%							
Total	Per cent	Out bound Passby							
Destination		% of Out bound Passby	Nesbitt Rd Driveway	McKeeRd Driveway	Ft chr ona Rd Driveway	Total	Nesbitt Rd Driveway*	McKeeRd Driveway*	Ft chr ona Rd Driveway*
McKee Road (West)		20%	35%	5%	60%	100%	1.8%	0.3%	3.0%
Nesbitt Road (Southwest)		5%	50%	0%	50%	100%	0.6%	0.0%	0.6%
Verona Road (South)		35%	40%	40%	20%	100%	3.5%	3.5%	1.8%
Verona Road (North)		20%	40%	40%	20%	100%	2.0%	2.0%	1.0%
McKee Road (East)		20%	40%	40%	20%	100%	2.0%	2.0%	1.0%
Total		100				Total	9.9%	7.8%	7.4%

* As a percent of single origin/destination

** As a percent of all origins/destinations

Inbound PassbyTri ps

Or igh	Tot al		Nesbt t Rd Driveway	McKeeRd Driveway	Ft chr ona Rd Driveway
McKee Road (West)	20		1	15	4
Nesbitt Road (Southwest)	5		2	0	2
Verona Road (South)	15		6	6	3
Verona Road (North)	40		16	16	8
McKee Road (East)	20		8	8	4
Tot al	100		33	45	21

Out bound PassbyTri ps

Dest hat on	Tot al		Nesbt t Rd Driveway	McKeeRd Driveway	Ft chr ona Rd Driveway
McKee Road (West)	19		7	1	11
Nesbitt Road (Southwest)	5		2	0	2
Verona Road (South)	33		13	13	7
Verona Road (North)	19		8	8	4
McKee Road (East)	19		8	8	4
Tot al	96		38	30	28

SECTION 5
TRAFFIC AND IMPROVEMENT ANALYSIS

PART A. BASE AND RECOMMENDED CONDITIONS

Challenges exist for any capacity expansion to McKee Road. The recently reconstructed roadway has a high voltage power line along the south curb line, making it difficult to even install or extend auxiliary lanes (see Figure 5A-1). These site conditions must be considered when reviewing the future geometric needs of the roadway.

1. Base Conditions

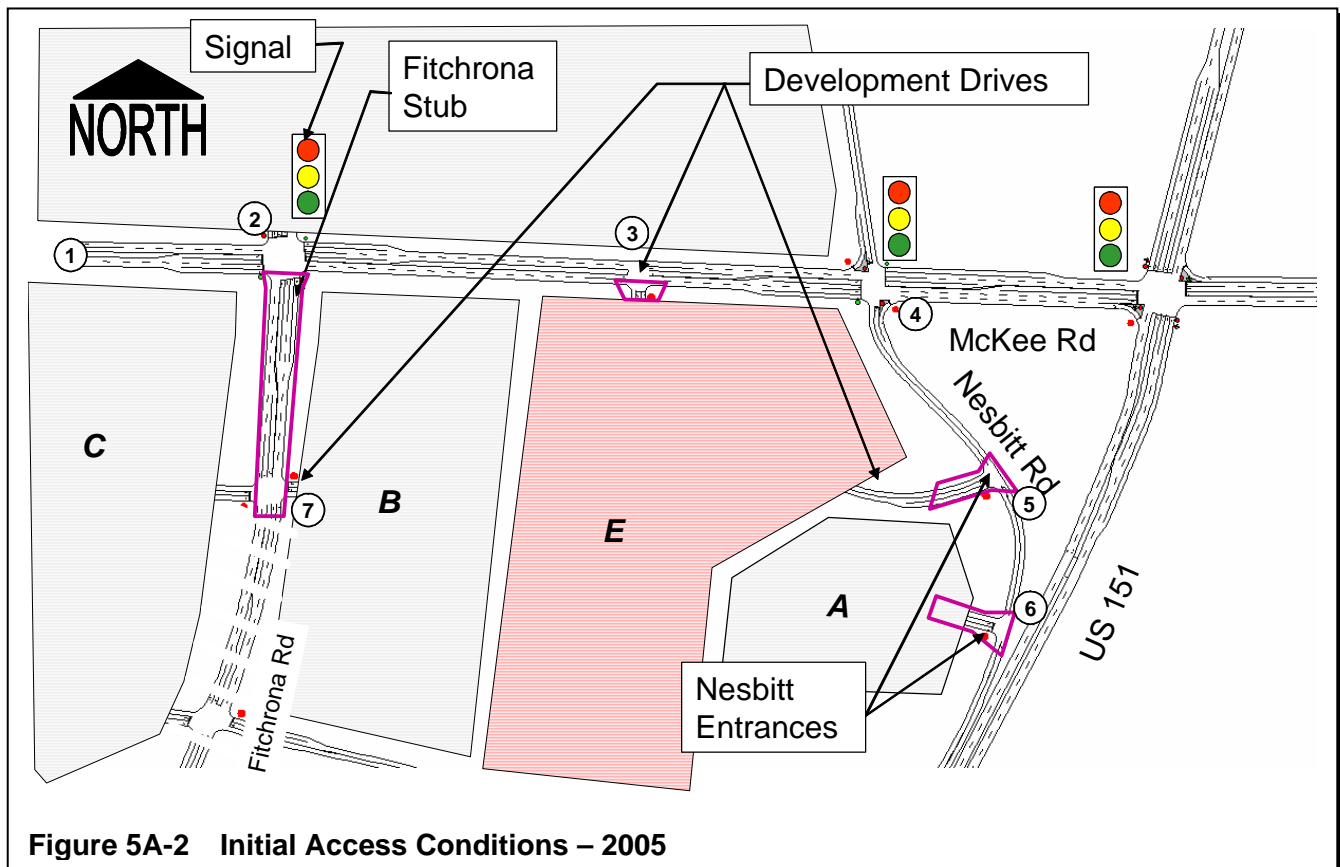
Each of the five developments will require improvements to the roadway network just to provide site access. For the purposes of analysis, this study assumed the following basic site access improvements for 2005:



Figure 5A-1 Power Poles on McKee Road

- Provision of an Access Point onto McKee Road for Development C (Access Point 1)
- Provision of a Fitchrona Road connection to McKee Road and into Development D. (Access Point 2)
 - Signalization of the McKee Road/Fitchrona Road intersection.
- Coordination of the McKee Road/Fitchrona Road, McKee Road/Nesbitt Road, and McKee Road/Verona Road signals with a cycle length that accommodates pedestrian crossings.
- Provision of an access point onto McKee Road for Development D and E. (Access Point 3)
- Expansion of the McKee Road/Nesbitt Road intersection. (Access Point 4)
- Provision of an access point on Nesbitt Road for Development A and E. (Access Point 5)
- Provision of an exclusive entrance for Development A. (Access Point 6)
- Provision of an access point on Fitchrona Road for Development B and C. (Access Point 7).

No other changes to geometry or control were assumed for the initial access conditions for 2005. Figure 5A-2 schematically shows the assumed initial access conditions. These are not recommended conditions. Rather, they are basic improvements to connect the developments to their adjacent roadways.

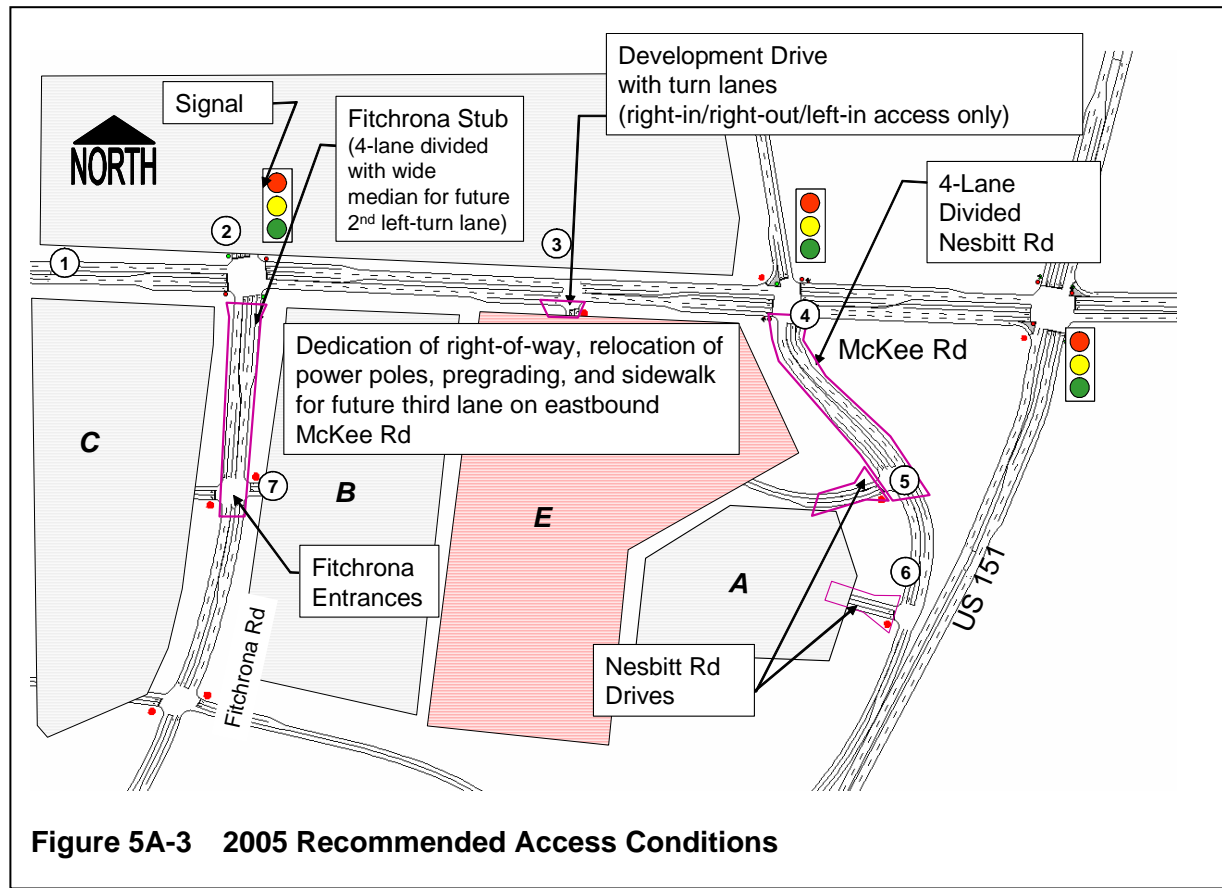


2. 2005 Recommended Conditions with Development E

The study assumes that Development E would occur before the other four developments. As Part B shows, the addition of Development E trips to the 2005 background network increases delay at intersections within the study area. The following improvements to geometry and control were analyzed to maintain operations on the adjacent roadway network:

- Reconstruction of Nesbitt Road as a four-lane divided roadway between McKee Road and the Development A entrance (Access Point 6).
- Reconstruction of the McKee Road/Nesbitt Road intersection to add left-turn lanes on the north and south approaches. (Access Point 4) As appropriate, the reconstruction should complement and accommodate the ultimate recommended geometries.
- Phasing changes at the McKee Road/Nesbitt Road intersection (including protected only left-turn movements from McKee Road and signalization of the right-turn movement from Nesbitt Road).
- Restriction of left-turns from the Development E drive onto McKee Road at the Access Point 3 location. The drive should operate as right-in/right-out/left-in only.

Figure 5A-3 schematically shows these recommended access conditions.



3. Conditions with Development E without Fitchrona Road

This report acknowledges that the construction of the Fitchrona Road stub is outside of the boundaries of Development E, and therefore the road's implementation may be delayed. This geometric condition analyses the effect of Development E traffic without the addition of Fitchrona Road.

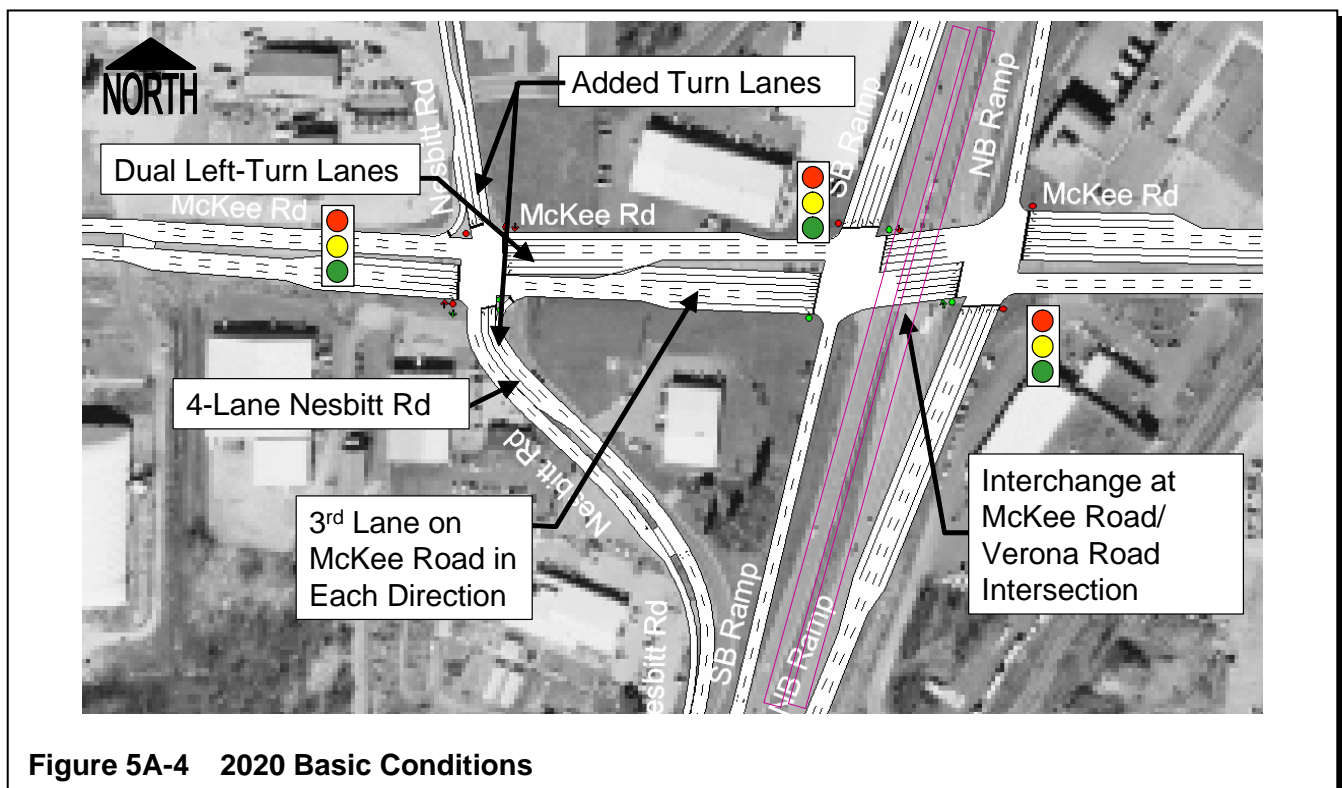
4. 2020 Background Recommended Conditions

Even without any development in the study area, background 2020 traffic demand will exceed the current capacity of the roadway network. The following improvements to geometry and control (from the existing conditions) are recommended to address the resultant needs:

- Grade separation of Verona Road with an interchange at McKee Road. The intersection will not be able to continue to function without a grade separation of Verona Road traffic.
- Addition of a third through lane in each direction on McKee Road.

- Construction of the McKee Road/Verona Road southbound ramp intersection with two left-turn lanes, one through lane, and two right-turn lanes on the north approach; two look-ahead left-turn lanes, three through lanes, and one right-turn lane on the west approach; and two left-turn lanes and three through lanes on the east approach.
- Construction of the McKee Road/Verona Road northbound ramp intersection with two left-turn lanes, one through lane, and two right-turn lanes on the south approach, two left-turn lanes and three through lanes on the west approach; and two look-ahead left-turn lanes, three through lanes, and two right-turn lanes on the east approach.
- Reconstruction of Nesbitt Road as a four-lane divided roadway between McKee Road and the Development A site.
- Reconstruction of McKee Road/Nesbitt Road intersection to add left-turn lanes on the north and south approaches and a second left-turn lane on the east approach.
- Phasing changes at the McKee Road/Nesbitt Road intersection (including protected-only left-turn movements from McKee Road and signalization of the right-turn movement from Nesbitt Road).

Figure 5A-4 schematically shows the basic roadway conditions needed to accommodate 2020 background traffic growth without the five developments studied in this report.



The five “on-site” developments will create additional needs beyond those of the 2020 background traffic. However, the basic network needed for the 2020 background conditions generally represent the maximum reasonable intersection geometries and roadway cross sections. Therefore, the following improvements (from 2020 basic roadway conditions) would help address, but not satisfy, those needs:

- Figure 5A-5 schematically shows the recommended ultimate geometry to accommodate the proposed development. A more detailed list is incorporated in Section 7.



PART B. CAPACITY/LEVEL OF SERVICE ANALYSIS

The following paragraphs describe the five geometry and volume scenarios that were examined in the study.

1. Initial Access Conditions with 2005 Background and Development E Traffic

With 2005 background and Development E traffic on the 2005 base roadway system, operations at the McKee Road/Nesbitt Road intersection would be marginal, and operations at the McKee Road/Verona Road intersection would be unsatisfactory. Vehicles exiting the development onto McKee Road may also experience substantial delay.

2. 2005 Recommended Access Conditions with 2005 Background and Development E Traffic

The initial recommended conditions (improvements) would provide marginally satisfactory operations at the McKee Road/Nesbitt Road intersection. They would not address the needs at the McKee Road/Verona Road intersection.

3. Conditions with Development E without Fitchrona Road

This report acknowledges that the construction of the Fitchrona Road stub is outside of the boundaries of Development E, and therefore the road's implementation may be delayed. An analysis of only Development E traffic shows that the Nesbitt Road/McKee Road intersection delays will be quite high (over 100 seconds of delay for the eastbound movement) without a portion of Development E's traffic being distributed to Fitchrona Road. Some of these eastbound movement delays are associated with queuing from the Verona Road/McKee Road intersection. These delays at the Nesbitt Road/McKee Road intersection may be an unavoidable consequence of the staging of area development.

4. Existing Conditions with 2020 Background Traffic

The existing conditions could not accommodate 2020 background traffic. Both the McKee Road/Nesbitt Road and McKee Road/Verona Road intersection would experience massive failure.

5. 2020 Basic Recommended Conditions with 2020 Background Traffic

As described in Section A, grade separation of Verona Road is recommended to accommodate the projected 2020 background volumes. The resultant ramp intersections would provide marginal operations (if evaluated as one intersection).

6. 2020 Recommended Ultimate Conditions with 2020 Background and Total Development Traffic

With background and total development traffic, the McKee Road/Verona Road intersection would provide marginal operations, and the McKee Road/Verona Road ramp intersections would provide unsatisfactory operations. When/if the Verona Road/McKee Road interchange is constructed, the turning movements and volumes need to be re-evaluated and interchange design type reviewed.

Figure 5B-1 summarizes the operating conditions for each of the scenarios. Exhibits 5B-1 through 5B-6 provide a more detailed summary of operating conditions by movement.

Intersection	1. 2005 Initial Access Cond w/ Development E		2. 2005 Recommended Access Cond w/ Development E		3. 2005 w/ Development E w/o Fitchrona Extension		4. Existing Cond w/ 2020 Background Traffic		5. 2020 Basic Recommended Conditions with 2020 Background Traffic		6. 2020 Recommended Ultimate Conditions with 2020 Background and Development Traffic	
	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS	Delay	LOS
1. McKee Rd/West Dev Drive											6	A
2. McKee Rd/Fitchrona Rd	7	A	6	A							28	C
3. McKee Rd/East Dev Drive	24	C	22	C	32	D					36	E
4. McKee Rd/Nesbitt Rd	60	E	55	D	57	E	> 100	F	50	D	54	D
McKee Rd/US 151 Intersection	90	F	92	F	88	F	> 100	F			*	*
McKee Rd/SB Ramp									25	C	48	D
McKee Rd/NB Ramp									27	C	92	F
5. Nesbitt Rd/North Dev Drive	12	B	6	A	6	A					16	C
6. Nesbitt Rd/South Dev Drive											4	A
7. Fitchrona Rd/North Dev Drive	5	A									6	A

Figure 5B-1 Operations Summary

PART C. QUEUING ANALYSIS

Exhibits 5B-1 through 5B-6 show the estimated 90 percent queue lengths at intersections within the study area. The 90 percent queue represents the length where 90 percent of the queues will be shorter than that length, and 10 percent of the queues may be greater. These 90 percent queue lengths were obtained by averaging the results from 9 SimTraffic runs.

The analysis suggests that, even with roadway improvements, queuing will remain a concern. Because of the proximity of McKee Road's intersections with Nesbitt Road and Verona Road (or its ramps), queues at one intersection would likely extend into the adjacent intersection. Turn lanes of a reasonable length might be insufficient to contain left-turn queues or to allow right-turning vehicles to bypass through queues. Queuing issues could be especially acute for the left-turn movement from westbound McKee Road onto southbound Nesbitt Road and for the left-turn movement from eastbound McKee Road onto northbound Verona Road.

Exhibit 5B-1 2005 Background Plus Development E Operating Conditions (Initial Access Conditions)

Exhibit 5B-1

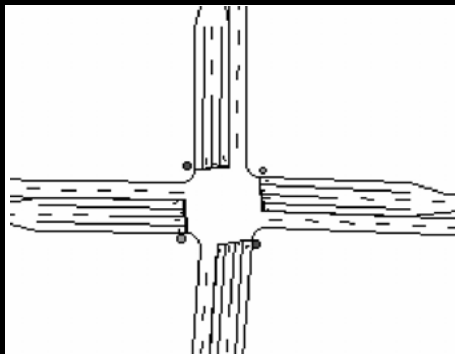
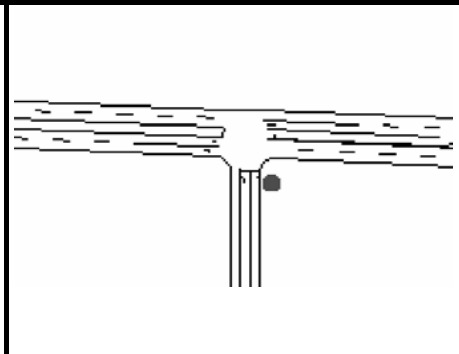
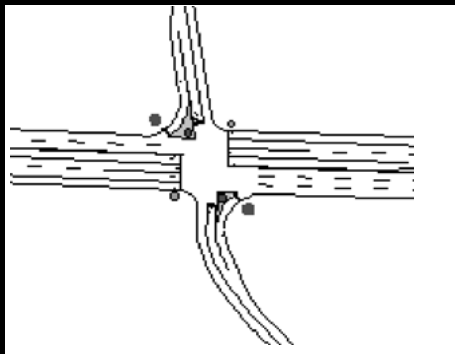
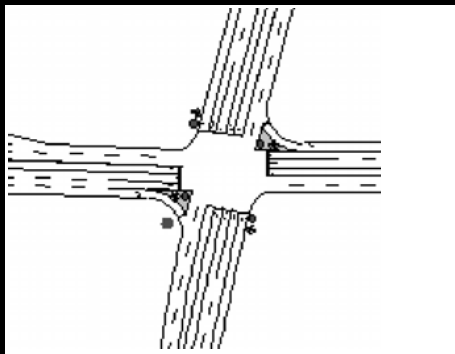
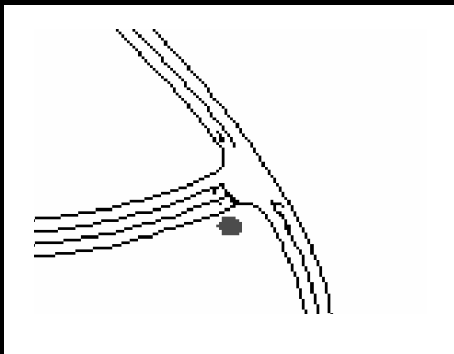
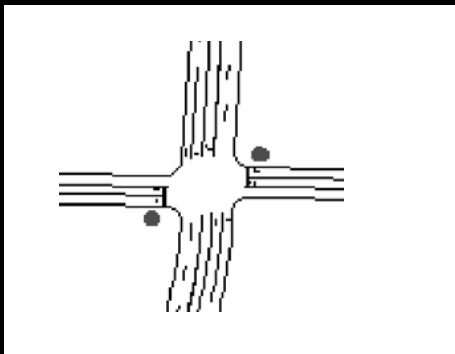
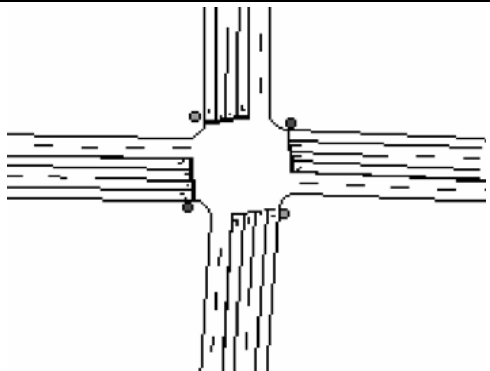
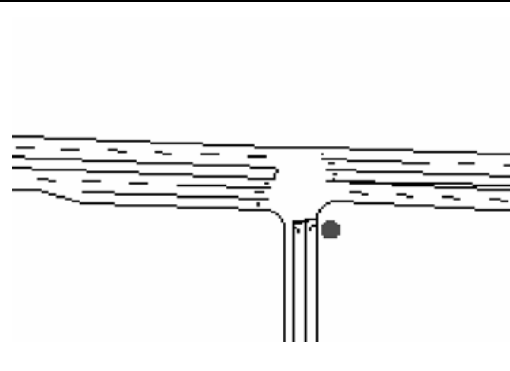
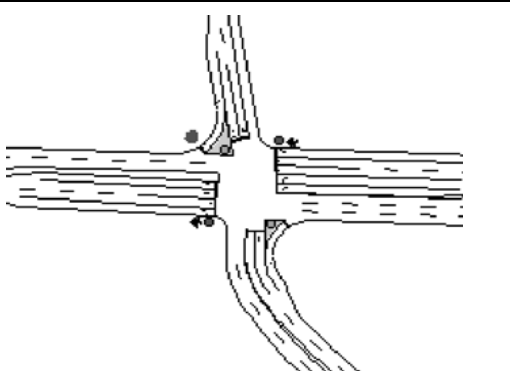
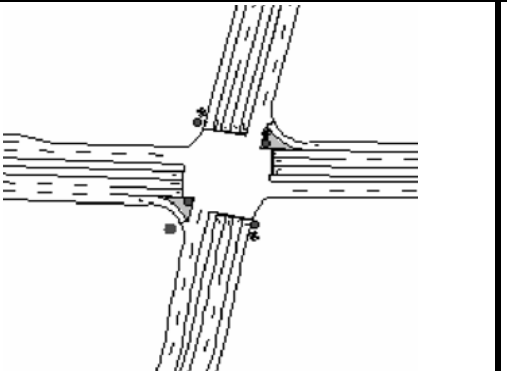
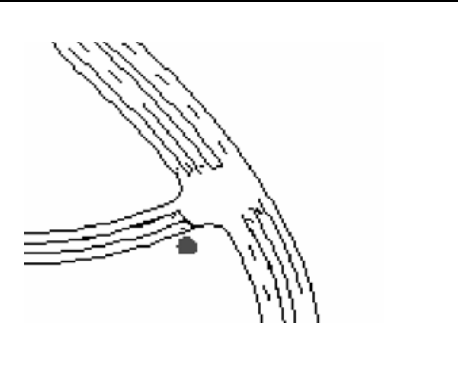
INTERSECTION	2. McKee Rd/Fitchrona Rd				3. McKee Rd/East Drive				4. McKee Rd/Nesbitt Rd				McKee Rd/Verona Rd				5. Nesbitt Rd/North Drive				7. Fitchrona Rd/North Drive			
																								
	Approach & Movement	Delay (s)	LOS (Sig)	Max. Queue (ft)	Approach & Movement	Delay (s)	LOS (Unsig)	Max. Queue (ft)	Approach & Movement	Delay (s)	LOS (Sig)	Max. Queue (ft)	Approach & Movement	Delay (s)	LOS (Sig)	Max. Queue (ft)	Approach & Movement	Delay (s)	LOS (Unsig)	Max. Queue (ft)	Approach & Movement	Delay (s)	LOS (Unsig)	Max. Queue (ft)
	NB R	7	A	26	NB R	99	F	169	NB R	62	E	128	NB R	10	B	118	NB T NB L	18	C	56	NB R	0	A	
	NB L	26	C	69	NB L	35	D	115	NB T NB L	78 87	E F	418 418	NB T NB L	39 > 100	D F	585 405		14	B	23				
	EB R	1	A	35	EB R	27	D	155	EB R	29	C	250	EB R	10	B	591	EB R EB L	13	B	25				
	EB T	8	A	165	EB T	40	E	690	EB T EB L	> 100 74	F E	563 237	EB T EB L	51 > 100	D F	670 386		41	E	115				
									SB R	22	C	132	SB R	27	C	494	SB R SB T	2	A		SB L	2	A	15
									SB T	66	E	324	SB T	71	E	730								
									SB L	66	E	324	SB L	> 100	F	522								
	WB T	5	A	196	WB T	3	A		WB R	3	A	33	WB R	24	C	439						WB R	8	A
	WB L	20	B	53	WB L	14	B	64	WB T	20	B	353	WB T	36	C	744					WB L	6	A	32
								WB L	38	D	243	WB L	65	E	351									
Intersection	7	A		Intersection	24	C		Intersection	60	E		Intersection	90	F		Intersection	12	B		Intersection	5	A		

Exhibit 5B-2 2005 Background Plus Development E Operating Conditions
(Recommended Access Conditions)

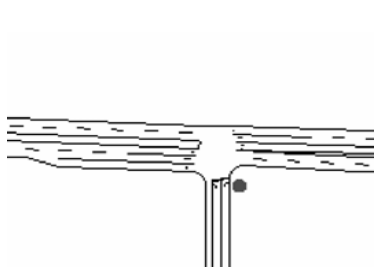
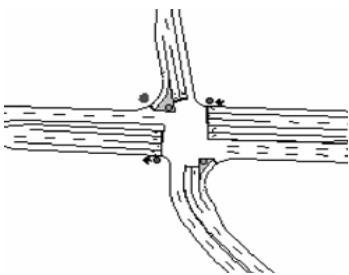
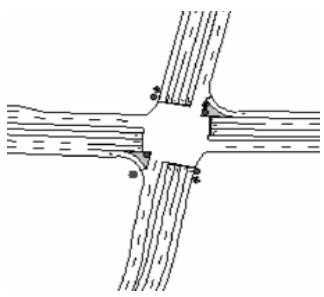

Exhibit 5B-2

INTERSECTION	2. McKee Rd/Fitchrona Rd				3. McKee Rd/East Drive				4. McKee Rd/Nesbitt Rd				McKee Rd/Verona Rd				5. Nesbitt Rd/North Drive			
																				
	Approach &		LOS	Max.	Approach &		LOS	Max.	Approach &		LOS	Max.	Approach &		LOS	Max.	Approach &		LOS	Max.
	Movement	Delay (s)	(Sig)	Queue (ft)	Movement	Delay (s)	(Unsig)	Queue (ft)	Movement	Delay (s)	(Sig)	Queue (ft)	Movement	Delay (s)	(Sig)	Max. Queue (ft)	Movement	Delay (s)	(Sig)	Queue (ft)
	NB R	5	A	32	NB R	> 100	F	181	NB R	38	D	94	NB R	9	A	138	NB T	8	A	7
	NB L	44	D	100	NB L	55	F	117	NB T	53	D	126	NB T	40	D	639	NB L	5	A	24
	EB R	1	A	17	EB R	12	B	173	NB L	84	F	332	NB L	> 100	F	417	EB R	8	A	23
EB T	5	A	239	EB T	34	D	674	EB R	24	C	219	EB R	10	A	604	EB T	50	D	662	
								EB T	> 100	F	557	EB T	50	D	662	EB L	21	B	75	
								EB L	76	E	208	EB L	> 100	F	384	SB R	30	C	486	
								SB R	8	A	64	SB R	30	C	486	SB T	79	E	719	
								SB T	37	D	151	SB T	79	E	719	SB L	> 100	F	516	
								SB L	> 100	F	176	SB L	> 100	F	516	WB R	20	B	434	
WB T	4	A	122	WB T	3	A		WB R	4	A	28	WB R	20	B	434	WB T	38	D	689	
WB L	21	C	141	WB L	18	C	96	WB T	17	B	233	WB T	38	D	689	WB L	79	E	352	
								WB L	31	C	195	WB L	79	E	352					
	Intersection	6	A		Intersection	22	C		Intersection	55	D		Intersection	92	F		Intersection	6	A	

Direction: NWB - Northwestbound, NB - Northbound, NEB - Northeastbound, EB - Eastbound, SEB - Southeastbound, SB - Southbound, SWB - Southwestbound, WB - Westbound
Movement: R - Right Turn, T - Through, L - Left Turn

Exhibit 5B-3 2005 Background Plus Development E w/o Fitchrona Road

Exhibit 5B-3

INTERSECTION	3. McKee Rd & North Dev Entrance			4. McKee Rd & Nesbitt Rd			McKee Rd & Verona Rd			5. Nesbitt Rd & East Dev Entrance		
												
SCENARIO												
	Approach & Movement	Delay (s)	LOS (Sig)	Approach & Movement	Delay (s)	LOS (Sig)	Approach & Movement	Delay (s)	LOS (Sig)	Approach & Movement	Delay (s)	LOS (Sig)
	NB R	165	F	NB R NB T NB L	4 29 98	A C F	NB R NB T NB L	12 40 327	B D F	NB T NB L	1 7	A A
	EB R EB T	17 55	B D	EB R EB T EB L	32 124 104	C F F	EB R EB T EB L	8 38 247	A D F	EB R EB L	8 25	A C
				SB R SB T SB L	8 36 36	A C D	SB R SB T SB L	29 78 478	C E F	SB R SB T	1 2	A A
	WB T WB L	4 30	A C	WB R WB T WB L	4 25 34	A C C	WB R WB T WB L	24 43 84	C D F			
	Intersection	32	C	Intersection	57	E	Intersection	88	F	Intersection	6	A

Direction: NWB - Northwestbound, NB - Northbound, NEB - Northeastbound, EB - Eastbound, SEB - Southeastbound, SB - Southbound, SWB - Southwestbound, WB - Westbound
Movement: R - Right Turn, T - Through, L - Left Turn

Exhibit 5B-4 2020 Background Operating Conditions
(Existing Transportation System)

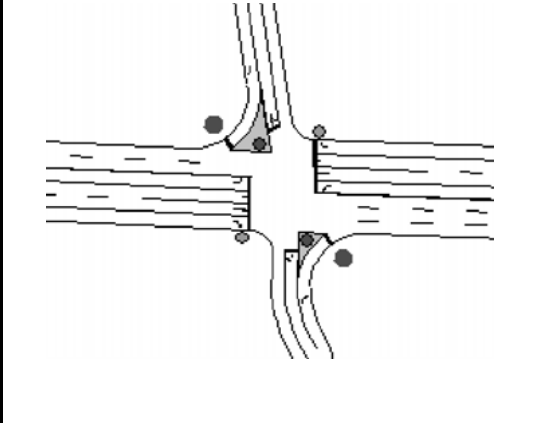
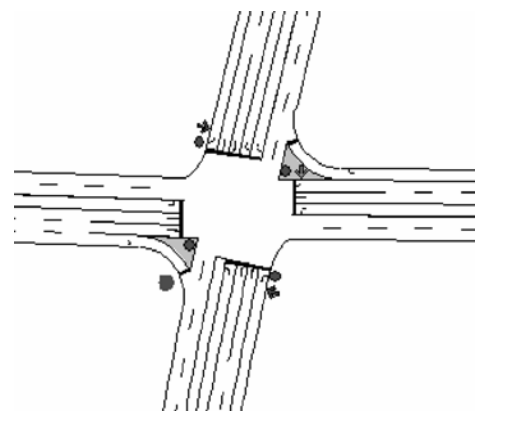
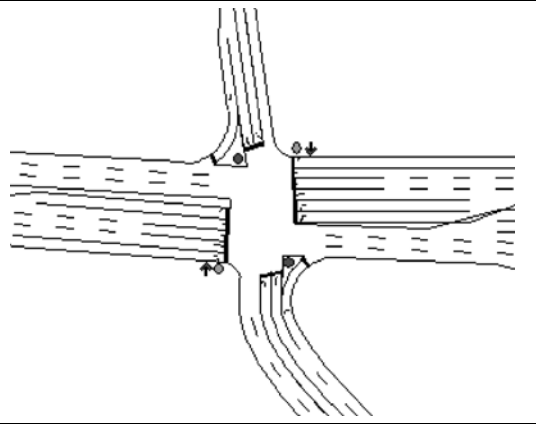
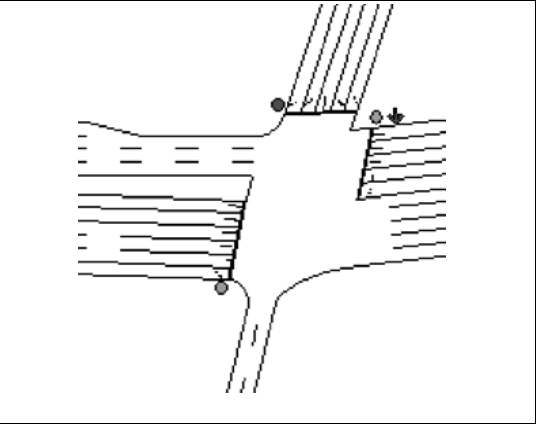
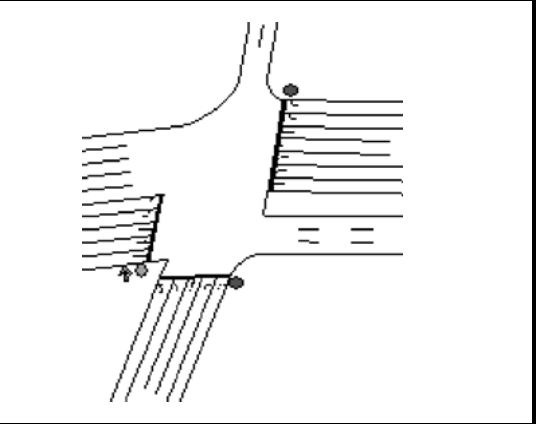
INTERSECTION	4. McKee Rd/Nesbitt Rd				McKee Rd/Verona Rd			
								
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	NB R	95	F	128	NB R	16	B	346
	NB T	> 100	F	555	NB T	56	D	529
	NB L	> 100	F	555	NB L	> 100	F	381
	EB R	47	D	176	EB R	7	A	535
	EB T	> 100	F	603	EB T	47	D	670
	EB L	> 100	F	206	EB L	> 100	F	388
	SB R	> 100	F	147	SB R	26	C	453
	SB T	> 100	F	493	SB T	79	E	726
	SB L	> 100	F	493	SB L	> 100	F	519
	WB R	4	A	26	WB R	34	C	443
	WB T	18	B	221	WB T	66	E	754
	WB L	43	D	201	WB L	> 100	F	356
	Intersection	> 100	F		Intersection	> 100	F	

Exhibit 5B-4

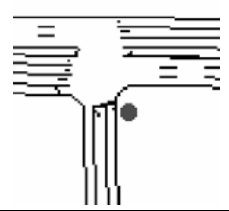
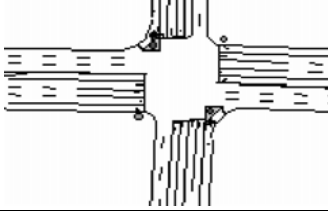
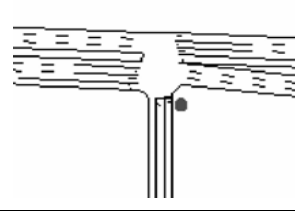
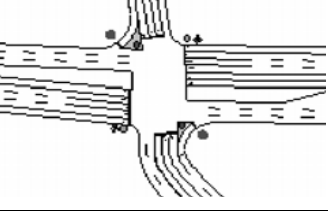

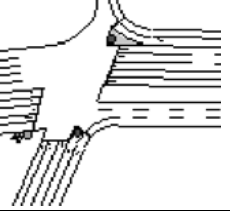
Exhibit 5B-5 2020 Background Operating Conditions
(2020 Background Recommended Transportation System)

Exhibit 5B-5

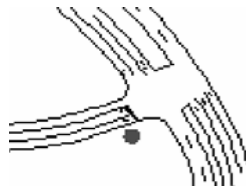
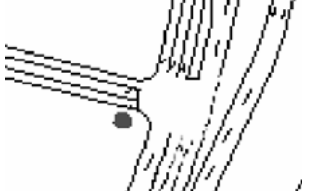
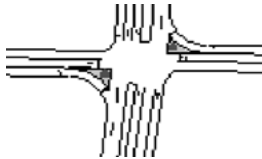
INTERSECTION	4. McKee Rd/Nesbitt Rd				McKee Rd/SB Ramp				McKee Rd/NB Ramp			
												
	Approach & Movement	Delay (s)	LOS (Sig)	Max. Queue (ft)	Approach & Movement	Delay (s)	LOS (Sig)	Max. Queue (ft)	Approach & Movement	Delay (s)	LOS (Sig)	Max. Queue (ft)
	NB R	2	A	60	EB R EB T	8 28	A C	101 157	NB R	12	B	96
	NB T	36	C	201					NB T	36	C	62
	NB L	81	F	208					NB L	37	D	80
	EB R	9	A	205	SB R SB T SB L	14 42 77	B D E	209 339 446	EB T	1	A	2
	EB T	69	E	496					EB L	2	A	18
	EB L	> 100	F	250					WB R WB T	19 72	B E	233 259
	SB R	17	B	146	WB R	3	A	26				
	SB T	50	D	426	WB T	3	A	26				
	SB L	52	D	195	WB L	3	A	26				
	WB R	4	A	88								
	WB T	30	C	470								
	WB L	82	F	237								
	Intersection	50	D		Intersection	25	C		Intersection	27	C	

**Exhibit 5B-6 2020 Background Plus Total Development Operating Conditions
(Ultimate Recommended Transportation System)**

Exhibit 5B-6

INTERSECTION	1. McKee Rd/West Drive				2. McKee Rd/Fitchrona Rd				3. McKee Rd/East Drive				4. McKee Rd/Nesbitt Rd				McKee Rd/SB Ramp				McKee Rd/NB Ramp					
																										
	Approach & Movement	Delay (s)	LOS (Unsig)	Max. Queue (ft)	Approach & Movement	Delay (s)	LOS (Sig)	Max. Queue (ft)	Approach & Movement	Delay (s)	LOS (Unsig)	Max. Queue (ft)	Approach & Movement	Delay (s)	LOS (Sig)	Max. Queue (ft)	Approach & Movement	Delay (s)	LOS (Sig)	Max. Queue (ft)	Approach & Movement	Delay (s)	LOS (Sig)	Max. Queue (ft)		
	NB R	32	D	157	NB R	27	C	219	NB R	> 100	F	232	NB R	8	A	236	EB R EB T	22 61	C E	260 455	NB R	31	C	201		
	NB L*	> 100	F	151	NB T	35	C	239	NB L*	> 100	F	316	NB T	65	E	364					NB T	45	D	58		
	EB R	6	A	9	NB L	> 100	F	233	EB R	10	B	33	NB L	> 100	F	237					NB L	48	D	238		
	EB T	3	A	110	EB R	10	A	208	EB T	29	D	615	EB R	24	C	279					EB T	2	A	113		
WB T WB L*	2 93	A F	41 147	EB T	31	C	449	WB T WB L	6 > 100	A F	126 183	EB L	> 100	F	184	EB T	61	E	455	WB R WB T	> 100 > 100	F F	638 1196			
				EB L	45	D	110					SB R	24	C	148	EB L	22	C	113							
				SB R	6	A	5					SB T	71	E	443	SB R	33	C	839							
				SB T	16	A	16					SB L	77	E	219	SB T	75	E	841							
Intersection	6	A		SB L	64	E	75	Intersection	28	C		WB R	9	A	154	WB T	7	A	89	Intersection	48	D		92	F	
				WB R	3	A	23					WB T	30	C	397	WB L	3	A	8							
				WB L	37	D	212					WB L	82	F	308											

* Asterisked movements should be prohibited.

INTERSECTION	5. Nesbitt Rd/North Drive				6. Nesbitt Rd/South Drive				7. Fitchrona Rd/North Drive			
												
	Approach & Movement	Delay (s)	LOS (Unsig)	Max. Queue (ft)	Approach & Movement	Delay (s)	LOS (Unsig)	Max. Queue (ft)	Approach & Movement	Delay (s)	LOS (Unsig)	Max. Queue (ft)
	NB T	10	B	115	NB T	4	A	96	NB R	1	A	2
	NB L	15	B	49	NB L	8	A	21	NB T	2	A	2
	EB R	30	D	94	EB R	8	A	24	NB L	5	A	20
	EB L	97	F	325	EB L	28	D	106	EB R	7	A	101
SB R	2	A	2	SB R	1	A	2	EB L	12	B		
SB T	2	A		SB T	1	A		SB R	1	A		
								SB T	1	A		
								SB L	4	A	63	
								WB R	8	A	48	
								WB L	13	B	36	
	Intersection	16	C		Intersection	4	A		Intersection	6	A	

PART D. PEDESTRIAN, BICYCLE, AND TRANSIT MOBILITY

As Section B of this chapter notes, the McKee Road corridor and, possibly, the Verona Road corridor will experience excessive delay during peak periods in 2020. Demand will exceed the capacity that can be reasonably provided at intersections along McKee Road. Without regional improvements, mobility will be substantially impaired.

In this context, pedestrian, bicycle, and transit corridors become important to maintaining local accessibility and community cohesion. They do not “solve” congestion. Rather, they provide an alternate means of mobility for those who choose to avoid that congestion. They connect neighborhoods and centers of activity that other transportation facilities have separated, and they provide the infrastructure necessary for incremental changes in travel behavior.

There are three important components to providing pedestrian, bicycle, and transit mobility:

1. Sensitive Design

The preliminary site layout for Development E does not serve pedestrians, bicyclists, and transit users. The discount store anchor and its outlots are set back and oriented away from McKee Road. Internal pedestrian and bicycle facilities (such as sidewalks, bicycle lanes, and multiuse trails) are not provided between the outlots and McKee Road or the outlots and the anchor discount store.

A modified site layout should encourage pedestrian, bicycle, and transit trips by locating retail entrances near McKee Road and placing parking to the side or rear of the property. Integrated bus stops, bicycle parking, and other pedestrian-scale amenities could further increase the walkability of the development. Buses should not be required to divert from a linear route to serve the development.

These same design principles can apply to the other four developments, two of which are assumed to include residential components.

2. Dedicated Corridors

Motor vehicles impair the travel of pedestrians, bicyclists, and transit users who lack separate corridors and facilities. This conflict discourages the use of alternative modes, which in turn exacerbates the conditions for motor vehicles.

A specific bicycle, pedestrian, and transit plan for the study area could be used to determine facilities and define continuous corridors for each mode. Pedestrian elements could include:

- Sidewalks with terraces.
- Enhanced crossings at intersections.
- Traffic-calming measures.
- Multiuse trails.
- Grade-separated crossings of Verona Road and McKee Road.

Bicycle elements could include:

- Bicycle lanes.
- Multiuse trails.
- Grade-separated crossings of Verona Road and McKee Road.
- Bicycle transit facility.

Transit elements could include:

- Dedicated transit lanes with signal preemption or prioritization.
- Preservation of right-of-way for future transit corridor.
- Site designs that do not require route deviations.
- Provisions for potential future commuter bus stop along Verona Road.

3. Program Support

Just as roads require ongoing maintenance, pedestrian, bicycle, transit, and transportation demand management programs require ongoing support.

Transit support is particularly relevant to the study area. The City currently contracts with Metro for limited transit service, which should be extended to serve the proposed developments. Participation in Metro's emerging bus pass program could complement this extension of service. Specifically, commercial landlords could provide tenants an allowance to purchase bus passes for their employees. Such a program could be an incentive for tenants and employees and could increase the attractiveness of the bus service for the City, Metro, and its riders.

PART E. SPEED CONSIDERATIONS

With the recommended improvements, lower speed limits on McKee Road may not be necessary. However, during peak periods, congestion would likely reduce actual vehicle speeds to below the speed limit.

PART F. TRAFFIC CONTROL NEEDS/WARRANT ANALYSIS

The ultimate recommended conditions include the addition of traffic signals at McKee Road/Fitchrona Road, the construction of a roundabout at Nesbitt Road/Fitchrona Road, an interchange with signalized ramp intersections at McKee Road/Verona Road, and modifications to phasing at the McKee Road/Nesbitt Road intersection.

With 2020 background plus total development traffic, the McKee Road/Fitchrona Road intersection would meet several signal warrants.

In 2005 with the Target Development, the Fitchrona Road/McKee Road satisfies the peak hour warrant (Warrant 3).

SECTION 6
CONCLUSIONS AND RECOMMENDATIONS

PART A. CONCLUSIONS

Traffic in the study area is increasing dramatically. Between Verona Road and Nesbitt Road, McKee Road currently carries about 21,000 vpd. The McKee Road/Verona Road intersection already experiences substantial delays in the morning and evening peak hours. Added 2005 retail development in the southwest quadrant of the intersection will increase these delays. It is possible to mitigate some delays on McKee Road by increasing the size of the Nesbitt Road/McKee Road intersection. It will be difficult to mitigate delays at the McKee Road/Verona Road intersection without full intersection reconstruction, a very expensive option.

By 2020, this background traffic could increase to 33,000 vpd. The addition of trips associated with the five “on-site” developments would increase 2020 traffic to 49,000 vpd, provided sufficient capacity exists on the network to deliver it. For comparison purposes, this volume exceeds the volume on Mineral Point Road west of the Beltline by 20 to 50 percent.

Even without any development in the study area, background traffic will create significant peak-hour transportation needs. Although roadway improvements can address some of these needs, unreasonably large roadway cross sections and intersection geometries would be necessary to maintain the levels of service that peak-hour traffic experiences today.

Any development in the study area will produce further demands on the roadway network. However, excessive peak-hour delay is already common at many intersections in the Madison metropolitan area and is likely to become more common by 2020. This study considers only reasonable and feasible roadway improvements, even though these improvements provide less than satisfactory peak-hour operations.

With 2020 background and total development traffic, reasonable roadway improvements could include:

1. Grade separation of Verona Road and McKee Road and installation of an interchange.
2. Expansion of McKee Road to a six-lane section.
3. Expansion of Nesbitt Road to a four-lane section.
4. Extension of Fitchrona Road north to McKee Road.
5. Significant improvements to geometry and/or control at all intersections in the study area.

With these improvements, the McKee Road/Nesbitt Road intersection would be larger than the McKee Road/Verona Road intersection is today.

Increased motor vehicle volumes and reduced motor vehicle mobility will impair pedestrian, bicycle, and transit mobility. As congestion increases, these modes will become more important for maintaining local accessibility and community cohesion. They will require:

1. Development site plans that encourage travel by foot, bicycle, and bus.
2. Dedicated corridors that facilitate safe, comfortable, and efficient pedestrian, bicycle, and transit travel even when roads are congested.
3. Program support that acknowledges the community and transportation benefits of these modes.

ART B. RECOMMENDATIONS

1. Initial 2005 Recommendations

In 2005, for the construction of Development E, we recommend the following infrastructure improvements:

- a. Provision of a Fitchrona Road connection to McKee Road (Access Point 2). This connection may initially be a stub and not connect to Nesbitt Road and south. Within the next 5 to 10 years (before the 2020 analysis year), Fitchrona Road should be a continuous corridor from the south. Fitchrona Road should be constructed as a four-lane divided roadway with a wide median that could ultimately accommodate a dual left turn lane at the McKee Road/Fitchrona Road intersection. This report acknowledges that the construction of the Fitchrona Road stub is outside of the boundaries of Development E, and therefore the road's implementation may be delayed. An analysis of Development E traffic only shows that the Nesbitt Road/McKee Road intersection delays will be quite high without some of Development E's traffic being distributed to Fitchrona Road. These delays may be an unavoidable consequence of the staging of area development. Left turns could be allowed out of Development E's McKee Road entrance (Access Point 3) until the Fitchrona Road connection is provided.
- b. An east-west internal circulation roadway that directs traffic to a future Fitchrona Road connection (Access Point 7). This internal roadway should also connect to Nesbitt Road through Access Point 5.
- c. Signalization of the McKee Road/Fitchrona Road intersection.
- d. Coordination of the McKee Road/Fitchrona Road, McKee Road/Nesbitt Road, and McKee Road/Verona Road signals with a cycle length that can accommodate pedestrian crossings.
- e. Provision of one access point on McKee Road for Development E (Access Point 3). This access should be limited to right-in/right-out/left-in only.¹

- f. Reconstruction of Nesbitt Road as a four-lane divided roadway between McKee Road and the Development A site.
- g. Reconstruction of the McKee Road/Nesbitt Road intersection (Access Point 4) to add left turn lanes on the north and south approaches. As appropriate, the reconstruction should complement and accommodate the ultimate recommended geometry.
- h. Phasing changes at the McKee Road/Nesbitt Road intersection (including protected only left-turn movements from McKee Road and possible signalization of the right-turn movement from Nesbitt Road).

2. Phased Necessary Improvements After 2005

As the other developments are realized, additional infrastructure improvements will be necessary, including:

- a. Provision of another access point on Nesbitt Road to serve Development A only. The access point should have left-turn and right turn lanes on the driveways only. (Access Point 6)
- b. Provision of an internal east-west roadway that connects Development B and E with Fitchrona Road and Nesbitt Road.
- c. Construction of a roundabout at the Fitchrona Road/Nesbitt Road intersection within the next five to ten years.
- d. Provision of another access point on McKee Road for Development C (Access Point 1). This access should be limited to right-in/right-out only.
- e. Provision of two additional access points on Fitchrona Road for Development C (Access Point 7). The access points should have left and right turn lanes on the driveways and left turn lanes on Fitchrona Road.

3. 2020 Geometry Needed for Background Growth

By the year 2020, additional improvements will be needed for the McKee Road corridor and how it relates to the USH 151 corridor, even without any development traffic. We recommend planning for the following improvements. The need for these improvements should be confirmed closer to the horizon year. Recommended improvements include:

- a. Grade separation of Verona Road with an interchange at McKee Road. The intersection will not be able to continue to function without a grade separation of US 151 traffic. The interchange ramps should have the configuration described in Section 5 of this report.

- b. Addition of a third through lane in each direction on McKee Road.
- c. Reconstruction of Nesbitt Road as a four-lane divided roadway between McKee Road and the Development A driveway (Access Point 6). (Note: This recommendation is also included in the 2005 recommendations for Development E.)
- d. Reconstruction of the McKee Road/Nesbitt Road intersection to add left turn lanes on the north and south approaches and a second left turn lane on the east and west approaches.
- e. Phasing changes at the McKee Road/Nesbitt Road intersection (including protected only-left-turn movements from McKee Road and signalization of the right-turn movement from Nesbitt Road).

4. 2020 Geometry Needed for Development Growth

Adding the five developments described in this report will increase transportation needs. These needs were discussed in detail in Section 5. We further recommend planning for the following improvements to accommodate development. The need and exact configuration of these improvements should be confirmed closer to the implementation year.

- Addition of a second right turn lane on the west approach of the southbound ramp intersection.
- Addition of a second left-turn on the south approach and a second left turn on the north approach of the McKee Road/Nesbitt Road intersection (Access Point 4).
- Addition of a second left turn lane on the south approach of the McKee Road/Fitchrona Road intersection (Access Point 2).
- Phasing changes to the McKee Road/Fitchrona Road intersection (including protected only-left-turn movements from Fitchrona Road).

5. Systemwide Considerations

There are also other systemwide considerations that should become part of a longer range plan for the area. These considerations focus around pedestrian, bicycle and neighborhood connectivity. These considerations are summarized as follows:

- a. Pedestrian and bicycle crossing of McKee Road will grow in difficulty. At some point, crossing McKee Road will be comparable to crossing University Avenue, East Washington Avenue, or Mineral Point Road. Additionally, providing pedestrian clearance time across McKee Road will decrease the amount of through green time given to motor

- vehicles. Ultimately a grade-separated ped/bike crossing should be considered, probably in the vicinity of Fitchrona Road.
- b. An east-west roadway that connects the Fitchrona Road extension to Nesbitt Road will probably be necessary to provide access to internal parcels. Additionally, this east-west roadway would provide a more direct alternative to McKee Road.
 - c. These retail and residential developments analyzed in this report will be somewhat isolated from the eastern part of Fitchburg. As traffic grows on Verona Road and McKee Road, it will become more and more difficult to gain east-west access through the Verona Road/McKee Road interchange/intersection. Consideration should be given to providing a grade-separated motor vehicle crossing of Verona Road south of McKee Road. This could occur with a future Nesbitt Crossing. Nesbitt Crossing would connect with Fitchrona Road, travel along the south edge of the developments discussed in this TIA, and ultimately cross US 151. Planning on the east side of Verona Road should consider a possible future connection.
 - d. As the area develops, larger residential areas could occur north of McKee Road, and large retail areas south of McKee Road are being proposed by developers. Consideration should be given to ped/bike connections and systems that would link these two land-use types.

SECTION 7
APPORTIONMENT OF COSTS

PART A – GOVERNMENT RESPONSIBILITIES

Government entities will need to provide transportation infrastructure improvements to accommodate the traffic growth on the Verona Road and McKee Road corridors. This report assumes the following infrastructure improvements would be provided by government entities.

- A grade-separated interchange at McKee Road. The intersection will not be able to continue to function without a grade separation of Verona Road traffic.
- Addition of a third through lane in each direction on McKee Road.
- Provision of another grade-separated crossing of US 151 somewhere south of McKee Road.

PART B – DEVELOPER RESPONSIBILITIES

The traffic developments analyzed in this report will create transportation needs that are beyond what would occur with normal background growth. Transportation improvements along McKee Road and Nesbitt Road are needed to maintain operations and provide access to the development. Preliminary estimates indicate that about \$1.5 million of improvements are needed from these developments – just to provide service levels that are somewhat less than desirable. This amounts to approximately \$700 to \$850 for every PM peak hour trip a development produces. The following paragraphs detail the improvement responsibilities and how they could be allocated to each development. The costs associated with the improvements do not include grading and earthwork. Also, dedication of right-of-way is considered incidental to the development.

Development A	Cost
1. Dedicate enough right-of-way (about 44 feet) along Nesbitt Road for a four-lane divided section.	Incidental
2. Extend the Nesbitt Road four-lane section (with bike lanes and turn lanes) to Access Point 6. South of Access Point 6 the four-lane roadway should transition to a two-lane roadway with bike lanes. The intersection configuration at Access Point 6 should have the following characteristics:	\$ 117,000
<ul style="list-style-type: none"> ▪ a southbound right turn lane ▪ two southbound through lanes that narrow to a single through lane south of the intersection ▪ a northbound through lane (that widens to two lanes north of the intersection.) ▪ a northbound left turn lane 	
3. Provide sidewalks on Nesbitt Road from the north property line to the south property line.	\$ 8,800
	\$ 125,800

Development B	Cost
1. Dedicate additional right-of-way along McKee Road sufficient for the future expansion of McKee Road to six lanes with an eastbound right turn lane at intersection 3.	Incidental
2. Relocate the McKee Road power poles to the southern edge of the new right-of-way. A clear zone will need to be provided around these poles.	\$ 60,000
3. Grade the new right-of-way to match the existing top-of-curb of McKee Road	Incidental
4. Relocate the McKee Road sidewalk to the southern edge of the new right-of-way.	\$ 12,000
5. Construct 600 feet of the Fitchrona Road/McKee Road intersection (intersection 2) south approach. This portion of Fitchrona Road should be a four-lane divided section with a left turn lane onto McKee Road. (Note: Since Site E will contribute half of the cost of this improvement, only half the cost is shown.)	\$ 130,000
The lanes on the south approach should include:	
<ul style="list-style-type: none"> ▪ a dedicated left turn lane 250 feet long ▪ a dedicated through lane (for future through or future dual left) ▪ a shared right turn/through lane ▪ dedicated right-of-way for a future right turn lane, when it is necessary. ▪ bike lanes ▪ sidewalk on both sides 	
6. Install the McKee Road/Fitchrona Road signal (intersection 2). (Note: Since Site E will contribute half of the cost of this improvement, only half the cost is shown.)	\$ 60,000
7. Provide an east/west two-lane roadway with bike lanes in site layout that connects Site E to Fitchrona Road.	Incidental
	<u>\$ 262,000</u>

Development C	Cost
1. Dedicate additional right-of-way along McKee Road sufficient for the future expansion of McKee Road to six lanes with an eastbound right turn lane at intersections 1 and 3.	Incidental
2. Relocate the McKee Road power poles to the edge of the new right-of-way.	\$ 60,000
3. Grade the new right-of-way to match the existing top-of-curb of McKee Road.	Incidental
4. Relocate the McKee Road sidewalk to the edge of the new right-of-way.	\$ 7,300
5. Dedicate right-of-way for a four-lane divided Fitchrona Road.	Incidental
6. Construct about 2,500 feet of Fitchrona Road to the connection with Nesbitt Road. The roadway should be a two-lane roadway, built to one side of the four-lane right-of-way. A 400-foot two to four lane transition will need to be constructed near the connection with McKee Road. Bike lanes should be provided.	\$ 308,000
7. If necessary, construct a right-in/right-out restricted driveway onto McKee Road (Access Point 1). A left-in entrance may be permitted depending on site layout.	\$ 24,600
▪ the intersection should be at least 600 feet from Fitchrona Road	
▪ the eastbound right turn lane should be at least 200 feet long	
	<hr/> \$ 399,900
Development D	Cost
1. Dedicate additional right-of-way along McKee Road sufficient for the future expansion of McKee Road to six lanes with an eastbound right turn lane at Access Point 3.	Incidental
2. Grade the new right-of-way to match the existing top-of-curb of McKee Road.	Incidental
3. Relocate/provide McKee Road sidewalk to the edge of the new right-of-way.	\$ 36,700
4. Reconstruct the north approach of the Nesbitt Road/McKee Road intersection (Access Point 4). The approach should include:	\$ 79,600
▪ a dedicated dual left turn lane at least 200 feet long	
▪ a dedicated through lane	
▪ a dedicated right turn lane at least 150 feet long	
5. If necessary, construct a right-in, right-out, left-in entrance onto McKee Road (Access Point 3). The entrance should be across from the Site E entrance.	\$ 34,900
▪ the eastbound right turn lane should be at least 200 feet long	
▪ the westbound left turn lane should be at least 150 feet long	
6. Construct 150-foot stub of Fitchrona Road north approach (Access Point 2).	\$ 38,500
7. Construct remainder of Fitchrona Road within development.	Incidental
	<hr/> \$ 189,700

Development E	Cost
1a. Purchase R/W for Access Point 5.	\$ 70,000
1. Construct development drive 400 feet from the McKee Road intersection (Access Point 5). Cost includes acquisition of a portion of Site A.	\$ 15,800
2. Expand the south approach of the Nesbitt/McKee Rd intersection to a four lane divided roadway from McKee Road (Access Point 4) through Access Point 5. The south approach should include:	\$ 97,000
▪ 2 dedicated left turn lanes at least 250 feet long. Only one left turn lane should be constructed initially.	
▪ a dedicated through lane	
▪ a dedicated right turn lane at least 600 feet long	
▪ bike lanes	
3. Provide a channelized northbound left turn lane at least 100 feet long at Access Point 5.	See site A
4. Extend the westbound left turn lane so that it is at least 200 feet long at Access Point 3.	\$ 18,000
5. Provide an eastbound right turn lane at least 200 feet long at Access Point 3.	\$ 18,000
6. Provide an island in south approach of Access Point 3 that prevents left turns from this approach.	\$ 7,200
7. Dedicate additional right-of-way along McKee Road sufficient for the future expansion of McKee Road to six lanes with an eastbound right turn lane at Access Point 3.	Incidental
8. Relocate the McKee Road power poles to the edge of the new right-of-way. A clear zone will need to be provided around these poles.	\$ 90,000
9. Grade the new right-of-way to match the existing top-of-curb of McKee Road.	Incidental
10. Relocate the McKee Road sidewalk to the edge of the new right-of-way.	\$ 18,000
11. Set aside half of the cost for 600 feet of the south approach of the Fitchrona Road/McKee Road intersection (Access Point 2). This will be constructed when Site B is developed.	\$ 130,000
12. Set aside half of the cost for the Fitchrona Road/McKee Road intersection signal (Access Point 2). This will be installed when Site B is developed.	\$ 60,000
13. Make provisions in site layout for a westerly roadway with bike lanes that connects to Fitchrona Road at Access Point 7.	Incidental
	<u>\$ 524,000</u>

Almost all of the apportioned improvements are adjacent or within the proposed development site. The one exception is Development E, which pays for a portion of the Fitchrona Road stub. Exiting traffic from Development E oriented west needs an outlet other than Nesbitt Road. Otherwise too much time is required to service Nesbitt Road at the Nesbitt Road/McKee Road intersection's south approach. Therefore, the Fitchrona Road stub is needed to service some of Development E's exiting traffic.

General – Overall Area Considerations

1. Costs for the Fitchrona Road connection with Nesbitt Road (possibly a roundabout) are not included in this estimate of costs. This connection should be given consideration by the City of Fitchburg.
2. Pedestrian and bicycle crossing of McKee Road will grow in difficulty. Ultimately a grade-separated ped/bike crossing should be considered - probably in the vicinity of Fitchrona Road.
3. There should be a connecting roadway (termed Nesbitt Crossing) that runs from Fitchrona Road to Nesbitt Road. Costs for this road are not included in these estimates.
4. These developments will be somewhat isolated from the eastern part of Fitchburg. As traffic grows on Verona Road, it will become more difficult to gain east-west access through the Verona Road/McKee Road interchange/intersection. Consideration should be given to providing a grade-separated, motor vehicle crossing of Verona Road with a future Nesbitt Crossing. Nesbitt Crossing would connect with Fitchrona Road, travel along the south edge of the developments discussed in this TIA, and ultimately cross Verona Road. Planning on the east side of Verona Road should consider a possible future connection.
5. Development assumptions used in this report suggest that there could be large residential areas north of McKee Road and large retail areas south of McKee Road. Existing development includes a cinema east of Verona Road. Consideration should be given to ped/bike connections and systems that would link these land-use types.

AADT – Annual average daily traffic – The total yearly traffic averaged over a full year.

ADA – Americans with Disabilities Act of 1990.

Area of significant traffic impact – The geographical area that includes the transportation facilities significantly impacted by the site traffic.

Capacity – The maximum hourly rate at which vehicles can reasonably be expected to traverse a point or uniform section of a lane or roadway during a given time period under prevailing roadway, traffic, and control conditions.

Horizon year – The target year of analysis.

Influence area – The geographical area surrounding the site from which the development is likely to draw a high percentage of the total site traffic.

G/C – The ratio of a green time to total cycle time for a traffic signal.

Level of Service – A qualitative measure describing operational conditions within a traffic stream and their perception by motorists and/or passengers.

Mode split – The estimation of the number of trips made by each mode (automobile, pedestrian, transit, etc.).

MPO – Metropolitan Planning Organization

Pass-by trips – Those trips that are diverted from traffic already on the roadway system.

Peak-hour factor (PHF) – The ratio of total hourly volume to four times the maximum 15-minute volume within the hour.

Saturation flow rate – The number of vehicles per hour per lane that can pass through an intersection if the green indication were available for the full hour and the flow of vehicles was never halted.

Stopped-time delay – The time an individual vehicle spends stopped in a queue while waiting to enter an intersection.

Traffic generation – The estimation of the number of origins from and destinations to a site resulting from the land-use activity on that site.

Traffic generator – A designated land use (residential, commercial, office, industrial) that generates vehicular and/or pedestrian traffic to and from the site.

Traffic impact – The effect of site traffic on highway operations and safety.

Traffic impact analysis – A traffic engineering study that determines the potential traffic impacts of a proposed traffic generator. A complete analysis includes an estimation of future traffic with and without the proposed generator, analysis of traffic impacts, and recommended roadway improvements that may be necessary to accommodate the expected traffic.

Traffic mitigation – The reduction of traffic impacts on roadways and/or intersections to provide an acceptable level of service.

Trip assignment – The assignment of site plus nonsite traffic to specific streets and highways.

Trip distribution – The allocation of the site-generated traffic among all possible approach and departure routes.